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VOLUME II

DISEASES OF HORSES, SWINE AND POULTRY THEIR PREVENTION AND CURE

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HORSE, SWINE AND POULTRY DISEASES

PART I

26902

DISEASES OF HORSES.

HOW TO DIAGNOSE HORSE DISEASES.

ANIMALS of different races or families deport themselves differently under the influence of the same disease. The sensitive and highly organized Thoroughbred resists cerebral depression more than does the lymphatic draft horse. Hence a degree of fever that does not produce marked dullness in a Thoroughbred may cause the most abject dejection in a coarsely bred heavy draft horse. This and similar facts are of vast importance in the diagnosis of disease and in the recognition of its significance.

The cause of a disease is important, not only in connection with diagnosis, but also in connection with treatment. The character of food that the horse has had, the use to which he has been put, and the kind of care he has received should all be inquired into closely. It may be found by this investigation that the horse has been fed on damaged food, such as brewer's grains or moldy silage, and this may be sufficient to explain the profound depression and weakness that are characteristic of forage poisoning. If it is learned that the horse has been kept in the stable without exercise for several days and upon full rations, and that he became suddenly lame in his back and hind legs, and finally fell to the ground from what appeared to be partial paralysis, this knowledge, taken in connection with a few evident symptoms, will be enough to establish a diagnosis of azoturia. If it is learned that the horse has been recently shipped in the cars or has been through a dealer's stable, we have knowledge of significance in connection with the causation of a possible febrile disease, which is, under these conditions, likely to prove to be influenza, or edematous pneumonia. It is also important to know whether the particular horse that is under examination is the only one in the stable or on the premises that is similarly afflicted. If it is found that several horses are afflicted much in the same way, we have evidence here of a common cause of disease which may prove to be of an infectious nature. It sometimes happens that medicine given in excessive quantities produces symptoms resembling those of disease, so it is important that the examiner shall be fully informed as to the medication that has been employed.

General Appearance.—In tetanus, or lockjaw, the muscles of the face, neck, and shoulders are stiff and rigid, as well as the muscles of the jaw. This condition produces a peculiar attitude, that once seen is subsequently recognized as rather characteristic of this disease. A horse with tetanus stands with his muscles tense and his legs in a somewhat bracing position, as though he were gathered to repel a shock. The neck is stiff and hard, the face is drawn, and the nostrils are dilated. The tail is usually held up a little, and when pressed down against the thighs it springs back to its previous position. In inflammation of the throat the head is extended upon the neck, and the angle between the jaw and the lower border of the neck is opened as far as possible to relieve the pressure that otherwise would fall upon the throat. In dumminess, or immobility, the hanging position of the head and the stupid expression are rather characteristic. In pleurisy, peritonitis, and some other painful diseases of the internal organs, the rigid position of the body denotes an effort of the animal to avoid pressure upon and to protect the inflamed sensitive region.

The horse may be down in a stall and unable to rise. This condition may result from azoturia, from forage poisoning, from tetanus, or from painful conditions of the bones or feet, such as founder. Lying down at unusual times or in unusual positions may indicate disease. The first symptom of colic may be a desire on the part of the horse to lie down at a time or place that is unusual or inappropriate. Sometimes disinclination to lie down is an indication of disease. Where there is difficulty in breathing, the horse knows that he can manage himself better upon his feet than upon his breast or his side. It happens, therefore, that in nearly all serious diseases of the respiratory tract the horse stands persistently, day and night, until recovery has commenced and breathing is easier, or until the animal falls from sheer exhaustion. Where there is stiffness and soreness of the muscles, as in rheumatism, inflammation of the muscles from overwork, or of the feet in founder, or where the muscles are stiff and beyond control of the animal, as in tetanus, a standing position is maintained, because the horse seems to realize that when he lies down he will be unable to arise.

Abnormal attitudes are assumed in painful diseases of the digestive organs (colic). A horse with colic may sit upon his haunches, like a dog, or may stand upon his hind feet and rest upon his knees in front, or may endeavor to balance himself upon his back, with all four feet in the air. These positions are assumed because they give relief from pain by lessening pressure, or tension, upon the sensitive structures.

Under the general condition of the animal it is necessary to observe the condition, or state, of nutrition; the conformation, so far as it may indicate the constitution; and the temperament. By observing the condition of nutrition one may be able to determine to a certain extent the effect that the disease has already had upon the animal and to estimate the amount of strength that remains and that will be available for the repair of the diseased tissues. A good condition of nutrition is shown by the pliability and softness of the skin, and the tone of the hair. If the subcutaneous fat has disappeared and the muscles are wasted, allowing the bony prominences to stand out; if the skin is tight and inelastic and the coat dry and harsh, we have evidence of a low state of nutrition. This may have resulted from a severe and long-continued disease or from a lack of proper food and care. Where an animal is emaciated—that is, becomes thin—there is first a loss of fat and later the muscles shrink.

The temperament of a horse is indicated by the manner in which he responds to external stimuli. When the horse is spoken to, or when he sees or feels anything that stimulates or gives alarm, if he responds actively, quickly, and intelligently, he is said to be of lively, or nervous, temperament. On the other hand, if he responds in a slow, sluggish manner, he is said to have a sluggish, or lymphatic, temperament. The temperament is indicated by the gait, by the expression of the face, and by the carriage of the head and ears. The nature of the temperament should be taken into consideration in an endeavor to ascertain the severity of a given case of illness, because the general expression of an animal in disease as well as in health depends to a large extent on the temperament.

The Skin and the Visible Mucous Membranes.—The condition of the skin is a fair index to the condition of the animal. There is no part of the body that loses its elasticity and tone as a result of disease sooner than the skin. Similarly, the condition of the animal is shown to a certain extent by the appearance of the mucous membranes. For example, when the horse is anemic as a result of disease or of inappropriate food the mucous membranes become pale. This change in the mucous membranes can be seen most readily in the lining of the eyelids and in the lining of the nostril. For convenience of examination the eyelids can readily be everted. Paleness means weak circulation or poor blood. Increased redness occurs physiologically in painful conditions, excitement, and following severe exertion. In fevers there is an increased redness in the mucous membrane, and this continues so long as the fever lasts. In some diseases red spots or streaks form in the mucous membrane. This usually indicates an infectious disease of considerable severity, and occurs in blood poisoning, purpura hemorrhagica, and hemorrhagic septicemia. When the liver is deranged and does not operate, or when the red-blood corpuscles are broken down, as in serious cases of influenza, there is a yellowish discoloration of the mucous membrane. The mucous membranes become bluish or blue when the blood is imperfectly oxidized and contains an excess of carbon dioxide. This condition exists in any serious disease of the respiratory tract, as pneumonia, and in heart failure.

The temperature of the skin varies with the temperature of the body. If there is fever the temperature of the skin is likely to be increased. Sometimes, however, as a result of poor circulation and irregular distribution of the blood, the body may be warmer than normal, while the extremities (the legs and ears) may be cold. Where the general surface of the body becomes cold it is evident that the small blood vessels in the skin have contracted and are keeping the blood away, as during a chill, or that the heart is weak and is unable to pump the blood to the surface, and that the animal is on the verge of collapse.

The skin is moist, to a certain degree, at all times in a healthy horse. This moisture is not in the form of a perceptible sweat, but it is enough to keep the skin pliable and to cause the hair to have a soft, healthy feel. In some chronic diseased conditions and in fever, the skin becomes dry.

When, during a fever, sweating occurs, it is usually an indication that the crisis is passed. Sometimes sweating is an indication of pain. A horse with tetanus or azoturia sweats profusely. Horses sweat freely when there is a serious impediment to respiration; they sweat under excitement, and, of course, from the well-known physiological causes of heat and work. Local sweating, or sweating of a restricted area of the body, denotes some kind of nerve interference.

Swellings of the skin usually come from wounds or other external causes and have no special connection with the diagnosis of internal diseases. There are, however, a number of conditions in which the swelling of the skin is a symptom of a derangement of some other part of the body. For example, there is the well-known stocking, or swelling of the legs about the fetlock joints, in influenza. There is the soft swelling of the hind legs that occurs so often in draft horses when standing still and that comes from previous inflammation or from insufficient heart power. Dropsy may occur beneath the chest or abdomen from heart insufficiency.

Wounds of the skin may be of importance in the diagnosis of internal disease. Wounds over the bony prominence, as the point of the hip, the point of the shoulder, and the greatest convexity of the ribs, occurs when a horse is unable to stand for a long time, and, through continually lying upon his side, has shut off the circulation to the portion of the skin that covers parts of the body that carry the greatest weight, and in this way has caused them to mortify. Little, round, soft, doughlike swellings occur on the skin and may be scattered freely over the surface of the body when the horse is afflicted with urticaria. Similar eruptions, but distributed less generally, about the size of a silver dollar, may occur as a symptom of dourine, or colt distemper. Hard lumps, from which radiate welt-like swellings of the lymphatics, occur in glanders, and blisterlike eruptions occur around the mouth and pasterns in horsepox.

The Organs of Circulation.—The first item in this portion of the examination consists in taking the pulse. The pulse may be counted and its character may be determined at any point where a large artery occupies a situation close to the skin and above a hard tissue, such as a bone, cartilage, or tendon. The most convenient place for taking the pulse of the horse is at the jaw. The external maxillary artery runs from between the jaws, around the lower border of the jawbone and up on the outside of the jawbone to the face. It is located immediately in front of the heavy muscles of the cheek. Its throb can be felt most distinctly just before it turns around the lower border of the jawbone. The balls of the first and second or of the second and third fingers should be pressed lightly on the skin over this artery when its pulsations are to be studied. The normal pulse of the healthy horse varies in frequency as follows:

Stallion	28 to 32 beats per minute.
Gelding	33 to 38 beats per minute.
Mare	34 to 40 beats per minute.
Foal 2 to 3 years old	40 to 50 beats per minute.
Foal 6 to 12 months old	45 to 60 beats per minute.
Foal 2 to 4 weeks old	70 to 90 beats per minute.

The pulse is accelerated by the digestion of rich food, by hot weather, exercise, and excitement. It is slightly more rapid in the evening than it is in the morning. Well-bred horses have a slightly more rapid pulse than sluggish, cold-blooded horses. The pulse should be regular; that is, the separate beats should follow each other after intervals of equal length, and the beats should be of equal fullness, or volume.

In disease, the pulse may become slower or more rapid than in health. Slowing of the pulse may be caused by old age, great exhaustion, or excessive cold. It may be due to depression of the central nervous system, as in dumminess, or be the result of the administration of drugs, such as digitalis or strophantus. A rapid pulse is almost always found in fever, and the more severe the infection and the weaker the heart the more rapid is the pulse. Under these conditions, the beats may rise to 80, 90, or even 120 per minute. When the pulse is above 100 per minute the outlook for recovery is not promising, and especially if this symptom accompanies high temperature or occurs late in an infectious disease. In nearly all of the diseases of the heart and in anemia the pulse becomes rapid.

The pulse is irregular in diseases of the heart, and especially where the valves are affected. The irregularity may consist in varying intervals between the beats or the dropping of one or more beats at regular or irregular intervals. The latter condition sometimes occurs in chronic diseases of the brain. The pulse is said to be weak, or soft, when the beats are indistinct, because little blood is forced through the artery by each contraction of the heart. This condition occurs when there is a constriction of the vessels leading from the heart and it occurs in certain infectious diseases, and is an indication of heart weakness.

In examining the heart itself it is necessary to recall that it lies in the anterior portion of the chest slightly to the left of the median line and that it extends from the third to the sixth rib. It extends almost to the breastbone, and a little more than half of the distance between the breastbone and the backbone. In contracting, it rotates slightly on its axis, so that the point of the heart, which lies below, is pressed against the left chest wall at a place immediately above the point of the elbow.

If the horse is not too fat, one may feel the impact of the apex of the heart against the chest wall with each contraction of the heart by placing the hand on the left side back of the fifth rib and above the point of the elbow. The thinner and the better bred the horse is the more distinctly this impact is felt. If the animal is excited, or if he has just been exercised, the impact is stronger than when the horse is at rest. If the horse is weak, the impact is reduced in force.

The examination of the heart with the ear is an important matter in this connection. Certain sounds are produced by each contraction of the normal heart. It is customary to divide these into two, and to call them the first and second sounds. These two sounds are heard during each pulsation, and any deviation of the normal indicates some alteration in the structure or the functions of the heart. In making this examination, one may apply the left ear over the heavy muscles of the shoulder back of the shoulder joint, and just above the point of the elbow, or, if the sounds are not heard distinctly, the left fore leg may be drawn forward by an assistant and the right ear placed against the lower portion of the chest wall that is exposed in this manner.

Temperature.—The temperature of the horse is determined roughly by placing the fingers in the mouth or between the thighs or by allowing the horse to exhale against the cheek or back of the hand. In accurate examination, however, these means of determining temperature are not relied upon, but recourse is had to the use of the thermometer. The thermometer used for taking the temperature of a horse is similar to that used by physicians, but larger, being from 5 to 6 inches long. The temperature of the animal is measured in the rectum.

The normal temperature of the horse varies somewhat under different conditions. It is higher in the young animal than in the old, and is higher in hot weather than in cold. The weather and exercise decidedly influence the temperature. The normal temperature varies from 99.5° to 101° F. If the temperature rises to 102.5° the horse is said to have a low fever; if the temperature reaches 104° the fever is moderate; if it reaches 106° it is high, and above this point it is regarded as very high. In some diseases, such as tetanus or sunstroke, the temperature goes as high as 108° or 110°. In the ordinary infectious diseases it does not often exceed 106°. A temperature of 107.5° and above is very dangerous and must be reduced promptly if the horse is to be saved.

The Organs of Respiration.—In examining this system of organs and their functions it is customary to begin by noting the frequency of the respiratory movements. This point can be determined by observing the motions of the nostrils or of the flanks; on a cold day one can see the condensation of the moisture of the warm air as it comes from the lungs. The normal rate of respiration for a healthy horse at rest is from 8 to 16 per minute. The rate is faster in young animals than in old, and is increased by work, hot weather, overfilling of the stomach, pregnancy, lying upon the side, etc.

The expired air is of about the temperature of the body. It contains considerable moisture, and it should come with equal force from each nostril and should not have an unpleasant odor. If the stream of air from one nostril is stronger than from the other, there is an indication of an obstruction in a nasal chamber. If the air possesses a bad odor, it is usually an indication of putrefaction of a tissue or secretion in some part of the respiratory tract. A bad odor is found where there is necrosis of the bone in the nasal passages or in chronic catarrh. An ulcerating tumor of the nose or throat may cause the breath to have an offensive odor. The most offensive breath occurs where there is gangrene of the lungs.

In some diseases there is a discharge from the nose. In order to determine the significance of the discharge it should be examined closely. One should ascertain whether it comes from one or both nostrils. If but from one nostril, it probably originates in the head. The color should be noted. A thin, watery discharge may be composed of serum, and it occurs in the earlier stages of nasal catarrh. An opalescent, slightly tinted discharge is composed of mucus and indicates a little more severe irritation. If the discharge is sticky and pus-like, a deeper difficulty or more advanced irritation is indicated. If the discharge contains flakes and clumps of more or less dried particles, it is probable that it originates within a cavity of the head. The discharge of glanders is of a peculiar sticky nature and adheres to the wings of the nostrils. The discharge of pneumonia is of a somewhat red or reddish brown color, and, on this account, has been described as a prune-juice discharge. The discharge may contain blood. If the blood appears as clots or as streaks in the discharge, it probably originates at some point in the upper part of the respiratory tract. If the blood is in the form of a fine froth, it comes from the lungs.

In examining the interior of the nasal passage one should remember that the normal color of the mucous membrane is a rosy pink and that its surface is smooth. If ulcers, swellings, or tumors are found, these indicate disease. The ulcer that is characteristic of glanders is described fully in connection with the discussion of that disease.

Between the lower jaws there are several clusters of lymphatic glands. These glands are so small and so soft that it is difficult to find them by feeling through the skin, but when a suppurative disease exists in the upper part of the respiratory tract these glands become swollen and easy to feel. They may become soft and break down and discharge as abscesses; this is seen constantly in strangles. On the other hand, they may become hard from the proliferation of connective tissue and attach themselves to the jawbone, to the tongue, or to the skin. This is seen in chronic glanders.

The manner in which the horse coughs is of importance in diagnosis. The purpose of the cough is to remove some irritant substance from the respiratory passages, and it occurs when irritant gases, such as smoke, ammonia, sulphur vapor, or dust, have been inhaled. It occurs from inhalation of cold air if the respiratory passages are sensitive from disease. In bronchitis and pneumonia, cough is very easily excited and occurs merely from accumulation of mucus and inflammatory product upon the irritated respiratory mucous membrane. If one wishes to determine the character of the cough, it can easily be excited by pressing upon the larynx with the thumb and finger. The larynx should be pressed from side to side and the pressure removed the moment the horse commences to cough. A painful cough occurs in pleurisy, also in bronchitis and bronchial pneumonia. Pain is shown by the effort the animal exerts to repress the cough. The cough is not painful, as a rule, in the chronic diseases of the respiratory tract. The force of the cough is considerable when it is not especially painful and when the lungs are not seriously involved. When the lungs are so diseased that they can not be filled with a large volume of air, and in heaves, the cough is weak, as it is also in weak, debilitated animals. If mucus or pus is coughed out, or if the cough is accompanied by a gurgling sound, it is said to be moist; it is dry when these characteristics are not present—that is, when the air in passing out passes over surface not loaded with secretion.

In the examination of the chest we resort to *percussion* and *auscultation.* Percussion is practiced with the fingers alone or with the aid of a special percussion hammer and an object to strike upon known as a pleximeter. If the fingers are used, the middle finger of the left hand should be pressed firmly against the side of the horse and should be struck with the ends of the fingers of the right hand bent at a right angle so as to form a hammer. After experience in this method of examination one can determine with a considerable degree of accuracy whether the lung contains a normal amount of air or not. If, as in pneumonia, air has been displaced by inflammatory product occupying the air space, or if fluid collects in the lower part of the chest, the percussion sound becomes dull. If, as in emphysema or in pneumothorax, there is an excess of air in the chest cavity, the percussion sound becomes abnormally loud and clear.

Auscultation consists in the examination of the lungs with the ear applied closely to the chest wall. As the air goes in and out of the lungs a certain soft sound is made which can be heard distinctly, especially upon inspiration. This sound is intensified by anything that accelerates the rate of respiration, such as exercise. This soft, rustling sound is known as vesicular murmur, and wherever it is heard it signifies that the lung contains air and is functionally active. The vesicular murmur is weakened when the lungs are compressed by fluid in the chest cavity. The vesicular murmur disappears when air is excluded by the accumulation of inflammatory product, as in pneumonia, and when the lungs are compressed by fluid in the chest cavity. The vesicular murmur becomes rough and harsh in the early stages of inflammation of the lungs, and this is often the first sign of the beginning of pneumonia.

Additional sounds are heard in the lungs in some diseased conditions. For example, when fluid collects in the air passages and the air is forced through it or is caused to pass through tubes containing secretions or pus. Such sounds are of a gurgling or bubbling nature and are known as mucous rales. Mucous rales are spoken of as being large or small as they are distinct or indistinct, depending upon the quantity of fluid that is present and the size of the tube in which this sound is produced. Mucous rales occur in pneumonia after the solidified parts begin to break down at the end of the disease. They occur in bronchitis and in tuberculosis, where there is an excess of secretion. Sometimes a shrill sound is heard, like the note of a whistle, fife, or flute. This is due to a dry constriction of the bronchial tubes and it is heard in chronic bronchitis and in tuberculosis. A friction sound is heard in pleurisy. This is due to the rubbing together of roughened surfaces, and the sound produced is similar to a dry rubbing sound that is caused by rubbing the hands together or by rubbing upon each other two dry, rough pieces of leather.

The Examination of the Digestive Tract.—The first point in connection with the examination of the organs of digestion is the appetite and the manner of taking food and drink. A healthy animal has a good appetite. Loss of appetite does not point to a special diseased condition, but comes from a variety of causes. Excitement, strange surroundings, fatigue, and hot weather may all cause loss of appetite. Where there is cerebral depression, fever, profound weakness, disorder of the stomach, or mechanical difficulty in chewing or swallowing, the appetite is diminished or destroyed. Sometimes there is an appetite or desire to eat abnormal things, such as dirty bedding, roots of grass, soil, etc. This desire usually comes from a chronic disturbance of nutrition.

Thirst is diminished in a good many mild diseases unaccompanied by distinct fever. It is seen where there is great exhaustion or depression or profound brain disturbance. Thirst is increased after profuse sweating, in diabetes, diarrhea, in fever, at the crisis of infectious diseases, and when the mouth is dry and hot.

Some diseases of the mouth or throat make it difficult for the horse to chew or swallow his food. Where difficulty in this respect is experienced, the following named conditions should be borne in mind and carefully looked for: Diseases of the teeth, consisting in decay, fracture, abscess formation, or overgrowth; inflammatory conditions, or wounds or tumors of the tongue, cheeks, or lips; paralysis of the muscles of chewing or swallowing; foreign bodies in upper part of the mouth between the molar teeth; inflammation of throat. Difficulty in swallowing is sometimes shown by the symptom known as "quidding." Quidding consists in dropping from the mouth well-chewed boluses of food. A mouthful of hay, for example, after being ground and masticated, is carried to the back part of the mouth. The horse then finds that from tenderness of the throat, or from some other cause, swallowing is difficult or painful, and the bolus is then dropped from the mouth. Another quantity of hay is similarly prepared, only to be dropped in turn. Sometimes quidding is due to a painful tooth, the bolus being dropped from the mouth when the tooth is struck and during the pang that follows. Quidding may be practiced so persistently that a considerable pile of boluses of food accumulate in the manger or on the floor of the stall. In pharyngitis one of the symptoms is a return through the nose of fluid that the horse attempts to swallow.

In some brain diseases the horse has a most peculiar manner of swallowing and of taking food. A similar condition is seen in hyperemia of the brain. In eating the horse will sink his muzzle into the grain in the feed box and eat for a while without raising the head. Long pauses are made while the food is in the mouth. Sometimes the horse will eat very rapidly for a little while and then slowly; the jaws may be brought together so forcibly that the teeth gnash. In eating hay the horse will stop at times with hay protruding from the mouth and stand stupidly, as though he has forgotten what he was about.

In examining the mouth one should first look for swellings or for evidence of abnormal conditions upon the exterior; that is, the front and sides of the face, the jaws, and about the muzzle. By this means wounds, fractures, tumors, abscesses, and disease accompanied by eruptions about the muzzle may be detected. The interior of the mouth is examined by holding the head up and inserting the fingers through the interdental space in such a way as to cause the mouth to open. The mucous membrane should be clean and of a light-pink color, excepting on the back of the tongue, where the color is a yellowish gray. As abnormalities of this region, the chief are diffuse inflammation, characterized by redness and catarrhal discharge; local inflammation, as from eruptions, ulcers, or wounds, and swellings. foreign bodies are sometimes found embedded in the mucous membrane lining of the mouth or lodged between the teeth.

The examination of the pharynx and of the esophagus is made chiefly by pressing upon the skin covering these organs in the region of the throat and along the left side of the neck in the jugular gutter. In examination of the abdomen one should remember that its size depends largely upon the breed, sex, and conformation of the animal, and also upon the manner in which the animal has been fed and the use to which it has been put. A pendulous abdomen may be the result of an abdominal tumor or of an accumulation of fluid in the abdominal cavity; or, on the other hand, it may merely be an indication of pregnancy, or of the fact that the horse has been fed for a long time on bulky and innutritious food. Pendulous abdomen occurring in a work horse kept on a concentrated diet is an abnormal condition. The abdomen may increase suddenly in volume from accumulation of gas in tympanic colic. The abdomen becomes small and the horse is said to be tucked up from long-continued poor appetite, as in diseases of the digestive tract and in fever. This condition also occurs in tetanus from the contraction of the abdominal walls and in diarrhea from emptiness.

In applying the ear to the flank, on either the right side or left side, certain bubbling sounds may be heard that are known as peristaltic sounds, because they are produced by wormlike contraction of the intestines. These sounds are a little louder on the right side than on the left on account of the fact that the large intestines lie in the right flank. Absence of peristaltic sounds is always an indication of disease, and suggests exhaustion or paralysis of the intestines. This may occur in certain kinds of colic and is an unfavorable symptom. Increased sounds are heard where the intestines are contracted more violently than in health, as in spasmodic colic, and also where there is an excess of fluid or gas in the intestinal canal.

The feces show, to a certain extent, the thoroughness of digestion. They should show that the food has been well ground, and should, in the horse, be free from offensive odor or coatings of mucus. A coating of mucus shows intestinal catarrh. Blood on the feces indicates severe inflammation. Very light color and bad odor may come from inactive liver.

Rectal examination consists in examination of the organs of the pelvic cavity and posterior portion of the abdominal cavity by the hand inserted in the rectum. This examination should be attempted by a veterinarian only, and is useless except to one who has a good knowledge of the anatomy of the parts concerned.

The Examination of the Nervous System.—The great brain, or cerebrum, is the seat of intelligence, and it contains the centers that control motion in many parts of the body. Abnormal mental excitement may be due to congestion of the brain or to inflammation. The animal so afflicted becomes vicious, pays no attention to commands, cries, runs about in a circle, stamps with the feet, strikes, kicks, etc. This condition is usually followed by a dull, stupid state, in which the animal stands with his head down, and irresponsive to external stimuli. Cerebral depression also occurs in the severe infectious diseases, in chronic diseases of the liver, and with chronic catarrh of the stomach and intestines.

Fainting is a symptom that is not often seen in horses. When it occurs it is shown by unsteadiness of gait, tottering, and, finally, inability to stand. The cause usually lies in a defect of the small brain, or cerebellum. This defect may be merely in respect of the blood supply, to congestion, or to anemia, and in this case it is likely to pass away and may never return, or it may be due to some permanent cause, as a tumor or an abscess, or it may result from a hemorrhage, from a defect of the valves of the heart, or from poisoning.

Loss of consciousness is known as coma. It is caused by hemorrhage in the brain, by profound exhaustion, or may result from a saturation of the system with the poison of some disease. Coma may follow upon cerebral depression, which occurs as a secondary state of inflammation of the brain.

Urinary and Sexual Organs.—In considering the examination of the urinary and sexual organs we may consider, at the beginning, a false impression that prevails to an astonishing extent. Many horsemen are in the habit of pressing upon the back of a horse over the loins or of sliding the ends of the fingers along on either side of the median line of this region. If the horse depresses his back it is at once said his kidneys are weak. Nothing could be more absurd or further from the truth. Any healthy horse—any horse with normal sensation and with a normally flexible back—will cause it to sink when manipulated in this way. If the kidneys are inflamed and sensitive, the back is held more rigidly and is not depressed under this pressure.

To examine the kidneys by pressure the pressure should be brought to bear over these organs. The kidneys lie beneath the ends of the transverse processes of the vertebræ of the loins and beneath the hindmost ribs. If the kidneys are actually inflamed and especially sensitive, pressure or light blows applied here may cause the horse to shrink.

The physical examination of the sexual and generative organs is made in large part through the rectum, and this portion of the examination should be carried out by a veterinarian only. By this means it is possible to discover or locate cysts of the kidneys, urinary calculi in the ureters, bladder, or upper urethra, malformations, and acute inflammations accompanied by pain. The external genital organs are swollen, discolored, or show a discharge as a result of local disease or from disease higher in the tract.

The manner of urinating is sometimes of considerable diagnostic importance. Painful urination is shown by frequent attempts, during which but a small quantity of urine is passed. This condition comes from inflammation of the bladder, stones of the bladder, or hemorrhage, tumors, bruises, etc. The urine is retained from spasms of the muscle at the neck of the bladder, from calculi, inflammatory growths, tumors, and paralysis of the bladder.

The urine dribbles without control when the neck of the bladder is weakened or paralyzed. This condition is seen after the bladder is weakened from long-continued retention and where there is a partial paralysis of the hind quarters.

Horses usually void urine five to seven times a day, and pass from 4 to 7 quarts. Disease may be shown by increase in the number of voidings or of the quantity. Frequent urination indicates an irritable or painful condition of the bladder. In one form of chronic inflammation of the kidneys and in polyuria the quantity may be increased to 20 or 30 quarts daily. Diminution in the quantity of urine comes from profuse sweating, diarrhea, high fever, weak heart, diseased and nonsecreting kidneys, or an obstruction to the flow.

The urine of the healthy horse is a pale or at times a slightly reddish yellow. The color is less intense when the quantity is large, and is more intense when the quantity is diminished. Dark-brown urine is seen in azoturia and in severe acute muscular rheumatism. A brownish-green color is seen in jaundice. Red color indicates admixture of blood from a bleeding point at some part of the urinary tract, usually in the kidneys.

The urine of the healthy horse is not clear and transparent. It contains mucus, which causes it to be slightly thick and stringy, and a certain amount of undissolved carbonates, causing it to be cloudy. A sediment collects when the urine is allowed to stand. The urine may be unusually cloudy from the addition of abnormal constituents, but to determine their character a chemical or microscopic examination is necessary. Red or reddish flakes or clumps in the urine are always abnormal, and denote a hemorrhage or suppuration in the urinary tract.—(Spl. Rpt. Horse, Dept. Ag. 1911.)

METHODS OF ADMINISTERING MEDICINES.

Medicine may enter the body through any of the following designated channels: First, by the mouth; second, by the air passages; third, by the skin; fourth, by the tissues beneath the skin; fifth, by the rectum; sixth, by the genito-urinary passages; and seventh, by the blood.

(1). Medicines can be given by the mouth in the form of solids, as powders or pills; liquids and pastes. Solids administered as powders should be as finely pulverized as possible, in order to secure rapid solution and absorption. Their action is in this way facilitated and intensified. Powders must be free from any irritant or caustic action upon the mouth. Those that are without any disagreeable taste or smell are readily eaten with the feed or taken in the drinking water. When placed with the feed they should first be dissolved or suspended in water and thus sprinkled on the feed. If mixed dry the horse will often leave the medicine in the bottom of his manger. Non-irritant powders may be given in capsules, as balls are given.

Pills, or balls, when properly made, are cylindrical in shape, 2 inches in length and about three-fourths of an inch in diameter. They should be fresh, but if necessary to keep them some time they should be made up with glycerin, or some such agent, to prevent their becoming too hard. Very old, hard balls are sometimes passed whole with the manure without being acted upon at all. Paper is sometimes wrapped around balls when given, if they are so sticky as to adhere to the fingers or the balling gun. Paper used for this purpose should be thin but firm, as the tougher tissue papers. Balls are preferred to drenches when the medicine is extremely disagreeable or nauseating; when the dose is not too large; when the horse is difficult to drench; or when the medicine is intended to act slowly. Certain medicines can not or should not be made into balls, as medicines requiring to be given in large doses, oils, caustic substances, unless in small dose and diluted and thoroughly mixed with the vehicle, deliquescent, or efflorescent salts. Substances suitable for balls can be made up by the addition of honey, sirup, soap, etc., when required for immediate use. Gelatin capsules of different sizes are now obtainable and are a convenient means of giving medicines in ball form.

Liquids may be given as drenches when the dose is large, or they may, when but a small quantity is administered, be injected into the mouth with a hard-rubber syringe or be poured upon the tongue from a small phial.

Pastes are medicines mixed with licorice-root powder, ground flaxseed, molasses, or sirup to the consistency of honey, or a soft solid. They are intended, chiefly, to act locally upon the mouth and throat. They are given by being spread upon the tongue, gums, or teeth with a wooden paddle or strong long-handled spoon.

When balls are to be given we should observe the following directions: In shape they should be cylindrical, of the size above mentioned, and soft enough to be easily compressed by the fingers. If made round or egg-shaped, if too long or too hard, they are liable to cause choking. Balls may be given with the balling gun (obtainable at any veterinary instrument maker's) or by the hand. If given by the hand a mouth speculum or gag may be used to prevent the animal from biting the hand or crushing the gall. Always loosen the horse before attempting to give a ball; if tied he may break his halter and injure himself or the one giving the ball. With a little practice it is much easier to give a ball without the mouth gag, as the horse always fights more or less against having his mouth forced open. The tongue must be firmly grasped with the left hand and gently pulled forward; the ball, slightly moistened, is then to be placed with the tips of the fingers of the right hand as far back into the mouth as possible; as the tongue is loosened it is drawn back into the mouth and carries the ball backward with it. The mouth should be kept closed for a minute or two. We should always have a pail of water at hand to offer the horse after balling. This precaution will often prevent him from coughing out the ball or its becoming lodged in the gullet.

It is, very often, impossible to get balls properly made, or to induce owners or attendants to attempt to give them, and for these reasons medicines by the mouth are mostly given in the form of liquids. When medicine is to be given as a drench we must be careful to use enough water or oil to dissolve or dilute it thoroughly; more than this makes the drench bulky and is unnecessary. Insoluble medicines, if not irritant, may be given simply suspended in water, the bottle to be well shaken immediately before giving the drench. The bottle used for drenching purposes should be clean, strong, and smooth about its neck; it should be without shoulders, tapering, and of a size to suit the amount given. A horn or tin bottle may be better, because they are not so easily broken by the teeth. If the dose is a small one the horse's head may be held up by the left hand, while the medicine is poured into the mouth by the right. The left thumb is to be placed in the angle of the lower jaw, and the fingers spread out in such a manner as to support the lower lip. Should the dose be large, the horse ugly, or the attendant unable to support the head as directed above, the head is then to be held up by running the tines of a long-handled wooden fork under the noseband of the halter or the halter strap or a rope may be fastened to the noseband and thrown over a limb, beam, or through a pulley suspended from the ceiling. Another way of supporting the head is to place a loop in the end of a rope, and introduce this loop into the mouth just behind the upper front teeth or tusks of the upper jaw, the free end to be run through a pulley, as before described, and held by an assistant. It is never to be fastened, as the horse might in that case do himself serious injury. The head is to be elevated just enough to prevent the horse from throwing the liquid out of his mouth. The line of the face should be horizontal, or only the least bit higher. If the head is drawn too high the animal can not swallow with ease or even with safety. The person giving the drench should stand on some object in order to reach the horse's mouth—on a level, or a little above it. The bottle or horn is then to be introduced at the side of the mouth, in front of the molar teeth, in an upward direction. This will cause the horse to open his mouth, when the base of the bottle is to be elevated, and about 4 ounces of the liquid allowed to escape on the tongue as far back as possible, care being taken not to get the neck of the bottle between the back teeth. The bottle is to be immediately removed, and if the horse does not swallow this can be encouraged by rubbing the fingers or neck of the bottle against the roof of the mouth, occasionally removing them. As soon as this is swallowed repeat the operation until he has taken all the drench. If coughing occurs, or if, by any mishap, the bottle should be crushed in the mouth, lower the head immediately.

Do not rub, pinch, or pound the throat nor draw out the tongue when giving a drench. These processes in no way aid the horse to swallow and oftener do harm than good. In drenching, swallowing may be hastened by pouring into the nose of the horse, while the head is high, a few teaspoonfuls of clean water, but *drenches must never be given through the nose.* Large quantities of medicine given by pouring into the nose are liable to strangle the animal, or, if the medicine is irritating, it sets up an inflammation of the nose, windpipe, and sometimes the lungs.

(2). Medicines are administered to the lungs and upper air passages by insufflation, inhalation, injection, and nasal douche. Insufflation consists of blowing an impalpable powder directly into the nose. It is but rarely resorted to. Gaseous and volatile medicines are given by inhalation, as is also medicated steam, or vapor. Of the gases used there may be mentioned, as the chief ones, sulphurous acid gas and, occasionally, chlorine. The animal or animals are to be placed in a tight room, where these gases are generated until the atmosphere is sufficiently impregnated with them. Volatile medicines—as the anesthetics (ether, chloroform, etc.)—are to be given by the attending surgeon only. Medicated vapors are to be inhaled by placing a bucket containing hot water, vinegar and water, scalded hay or bran, to which carbolic acid, iodine, creolin, compound tincture of benzoin, or other medicines have been added, in the bottom of a long grain bag. The horse's nose is to be inserted into the top of the bag, and he thus inhales the medicated steam. Care must be taken not to have this hot enough to scald the animal. The vapor from scalding bran or hay is often thus inhaled to favor discharges in sore throat or distemper.

Injections are made into the trachea by means of a hypodermic syringe. This method of medication is used for the purpose of treating local diseases of the trachea and upper bronchial tubes. It has also been used as a mode of administering remedies for their constitutional effect, but is now rarely used for this purpose.

The nasal douche is employed by the veterinarian in treating some local diseases of the nasal chambers. Special appliances and professional knowledge are necessary when using liquid medicines by this method. It is not often resorted to, even by veterinary surgeons, since, as a rule, the horse objects very strongly to this mode of medication.

(3). Medicines are often administered to our hair-covered animals by the skin, yet care must be taken in applying some medicines —as tobacco water, carbolic-acid solutions, strong creolin solutions, mercurial ointment, etc.—over the entire body, as poisoning and death follow in some instances from absorption through the skin. For the same reasons care must also be exercised and poisonous medicines not applied over very large raw or abraded surfaces. With domestic animals medicines are only to be applied by the skin to allay local pain or cure local disease.

(4). Medicines are frequently given by the hypodermic syringe under the skin. It is not safe for any but medical or veterinary practitioners to use this form of medication, since the medicines thus given are powerful poisons. There are many precautions to be observed, and a knowledge of anatomy is indispensable. One of the chief precautions has to do with the sterilization of the syringe. If it is not sterile an abscess may be produced.

(5). Medicines may be given by the rectum when they can not be given by the mouth, or when they are not retained in the stomach; when we want a local action on the last gut; when it is desired to destroy the small worms infesting the large bowels or to stimulate the motion of the intestines and cause evacuation. Medicines are in such cases given in the form of suppositories or as liquid injections. Foods may also be given in this way.

Suppositories are conical bodies made up of oil or theobroma and opium (or whatever medicine is indicated in special cases), and are introduced into the rectum or vagina to allay irritation and pain of these parts. They are not much used in treating horses.

Enemas, when given for absorption, should be small in quantity, neutral or slightly acid in reaction, and of a temperature of from 90° to 100° F. These, like foods given by the rectum, should be introduced only after the last bowel has been emptied by the hand or by copious injections of tepid water. Enemas, if to aid the action of physics, should be in quantities sufficient to distend the bowel and cause the animal to eject them. Simple water, salt and water, or soap and water, in quantities of a gallon or more, may be given every half hour. It is best that the horse retain them for some little time, as the liquid serves to moisten the dung and favor a passage. Stimulating enemas, as glycerin, should be administered after those already mentioned have emptied the last bowel, with the purpose of still further increasing the natural motion of the intestines and aiding the purging medicines.

Liquids may be thrown into the rectum by the means of a large syringe or a pump. A very good irrigator can be bought of any tinsmith at a trifling cost, and should be constantly at hand on every stock farm. It consists of a funnel about 6 inches deep and 7 inches in diameter, which is to be furnished with a prolongation to which a piece of rubber hose, such as small garden hose, 4 feet long may be attached. The hose, well oiled, is to be inserted gently into the rectum about 2 feet. The liquid to be injected may then be poured in the funnel and the pressure of the atmosphere will force it into the

Small Hog Held in Position for Vaccination. Serum Bottle and Covered Vessel for Serum and Dish for Disenfectant on Table. Dept. of Agr.

Waterford High School Class in Live Stock Examining a Hambletonian Mare. Y. B. 1905.

bowels. This appliance is better than the more complicated and expensive ones. Ordinary cold water or even ice-cold water is highly recommended by many as a rectal injection for horses overcome by the excessive heat of summer, and may be given by this simple pipe.

(6). This method of medication is especially useful in treating local diseases of the genito-urinary organs. It finds its chief application in the injection and cleansing of the uterus and vagina. For this purpose a large syringe or the irrigator described above may be used.

(7). Injections directly into veins are to be practiced by medical or veterinary practitioners only, as are probably some other means of giving medicines—intratracheal injections, etc.—(Spl. Rpt. Horse, Dept. Ag. 1911.)

INFECTIOUS AND GENERAL DISEASES.

STRANGLES.

(SYNONYMS: Distemper, colt-ill, catarrhal fever, one form of shipping fever.)

This is an infectious disease of the horse, mule, and ass; seen most frequently in young animals, and usually leaving an animal which has had one attack protected from future trouble of the same kind. It appears as a fever, lasting for a few days, with formation of matter, or pus, in the air tubes and lungs, and frequently the formation of abscesses in various parts of the body, both near the surface and in the internal organs. It usually leaves the animal after convalescence perfectly healthy and as good as it was before, but sometimes leaves it a roarer or is followed by the development of deep-seated abscesses, which may prove fatal.

Causes.—The cause of strangles is infection by direct contact with an animal suffering from the disease, or indirectly through contact with the discharges from an infected animal, or by means of the atmosphere in which an infected animal has been. There are many predisposing causes which render some animals much more subject to contract the disease than others. Early age, which has given it the popular name of colt-ill, offers many more subjects than the later periods of life do, for the animal can contract the disease but once, and the large majority of adult and old animals have derived an immunity from previous attacks. At 3, 4, or 5 years of age the colt, which has been at home, safe on a meadow or in a cozy barnyard, far from all intercourse with other animals or sources of contagion, is first put to work and driven to the market town or county fairs to be exposed to an atmosphere or to stables contaminated by other horses suffering from disease and serving as infecting agents. If it fails to contract it there, it is sold and shipped in foul, undisinfected railway cars to dealers' stables, equally unclean, where it meets many opportunities of infection. If it escapes so far, it reaches the time for heavier work and daily contact on the streets of towns or large cities, with numerous other horses and mules, some of which are sure to be the bearers of the germs of this or some other infectious disease, and at last it succumbs.

The period of the eruption of the last permanent teeth or the end of the period of development from the colt to an adult horse, at which time the animals usually have a tendency to fatten and be excessively full-blooded, also seems to be a predisposing period for the contraction of this as well as of the other infectious diseases. Thoroughbred colts are very susceptible, and frequently contract strangles at a somewhat earlier age than those of more humble origin. Mules and asses are much less susceptible and are but rarely affected. Other animals are not subject to this disease, but there is a certain analogy between it and distemper in dogs. After exposure to infection there is a period of incubation of the disease, lasting from two to four days, during which the animal enjoys its ordinary health.

Symptoms.—The horse at first is a little sluggish if used, or when placed in its stable is somewhat dejected, paying but moderate attention to the various disturbing surroundings. Its appetite is somewhat diminished in many cases, while in some cases the animal eats well throughout. Thirst is increased, but not a great deal of water is taken at one time. If a bucket of water is placed in the manger the patient will dip its nose into it and swallow a few mouthfuls, allowing some of it to drip back, and then stop, to return to it in a short time. The coat becomes dry and the hairs stand on end. At times the horse will have chills of one or the other leg, the fore quarters, or hind quarters, or in severe cases of the whole body, with trembling of the muscles and dryness of the skin.

If the eyes and mouth are examined the membranes are found reddened to a bright rosy color. The pulse is quickened and the breathing may be slightly accelerated. At the end of a couple of days a cough is heard and a discharge begins to come from the nostrils. This discharge is at first watery; it then becomes thicker, somewhat bluish in color, and sticky, and finally it assumes the yellowish color of matter and increases greatly in quantity.

At the outset the colt may sneeze occasionally and a cough is heard. The cough is at first repeated and harsh, but soon becomes softer and moist as the discharge increases. Again the cough varies according to the source of the discharge, for in light cases this may be only a catarrh of the nasal canals, or it may be from the throat, the wind-pipe, or the air tubes of the lungs, or even from the lungs themselves. According to the organ affected the symptoms and character of cough will be similar to those of a bronchitis, or lung fever caused by ordinary cold.

Shortly after the discharge is seen a swelling takes place under the jaw. This is at first puffy, swollen, somewhat hot and tender, and finally becomes distinctly so, and an abscess is felt, or having broken itself the discharge is seen dripping from a small opening. When the discharge from the nostrils has fully developed the fever usually disappears and the animal regains its appetite, unless the swelling is sufficient to interfere with the function of the throat, causing pain on any attempt to swallow. At the end of four or six days the discharge lessens, the soreness around the throat diminishes, the horse regains its appetite, and in two weeks has regained its usual condition. Old and strong horses may have the disease in so light a form that the fever is not noticeable; they may continue to eat and perform their ordinary work as usual and no symptom may be seen beyond a slight discharge from the nose and a rare cough, which is not sufficient to worry any but the most particular owner. But, on the other hand, the disease may become complicated so as to become a most serious disease, and even prove fatal in many cases. Inflammation of the bronchi, if excessive, will produce violent, harsh coughing, which may almost asphyxiate the animal. The large amount of discharge may be mixed with air by the difficult breathing, and the nostrils, the front of the animal, manger, and surrounding objects become covered with a white foam. The inflammation may be in the lung itself and cause the animal to breathe heavily, heave at the flanks, and show great distress. In this condition marked symptoms of fever are seen, the appetite is lost, the coat is dry, the horse stands back in its stall at the end of the halter strap with its neck extended and its legs propped apart to favor breathing. This condition may end by resolution, leaving the horse for some time with a severe cough, or the animal may die from choking up of the lungs.

The swelling under the jaw may be excessive, and if the abscess is not opened it burrows toward the throat or to the side and causes inflammation of the parotid glands and breaks in annoying fistulas at the sides of the throat and even up as high as the ears. Roaring may occur either during a moderately severe attack from inflammation of the throat, or at a later period as the result of continued lung trouble. Abscesses may develop in other parts of the body, in the poll, in the withers, or in the spaces of loose tissue under the arms, in the fold of the thigh, and, in entire horses, in the testicles.

During the course of the disease, or later, when the animal seems to be on the road to perfect recovery, abscesses may form in the internal organs and produce symptoms characteristic of disease of those parts.

Roaring, plunging, wandering in a circle, or standing with the head wedged in a corner of the stall indicate the collection of matter in the brain. Sudden and severe lung symptoms, without previous discharge, point to an abscess between the lungs, in the mediastinum; colic, which is often continuous for days, is the result of the formation of an abscess in some part of the abdominal cavity.

Pathology.—The lesions of strangles are found on the surface of the mucous membranes, essentially of the respiratory system, and in the loose connective tissue fibers of the internal organs and glands, and consist of acute inflammatory changes, tending to the formation of matter. The blood is unaltered, though it is rich in fibrin, and if the animal has died of asphyxia it is found dark colored when the body is first opened.

Treatment.—Ordinary light cases require but little treatment beyond diet, warm washes, moistened hay, warm coverings, and protection from exposure to cold. The latter is urgently called for, as lung complications, severe bronchitis, and laryngitis are often the results of neglect of this precaution. If the fever is excessive, the horse may receive small quantities of Glauber's salts (handful three times a day), as a laxative, bicarbonate of soda or niter in 1-dram doses every few hours, and small doses of iodide of potash, aconite, or quinine. Steaming the head with the vapor of warm water poured over a bucket of bran and hay, in which belladonna leaves or tar have been placed, will allay the inflammation of the mucous membranes and greatly ease the cough.

The swelling of the glands should be promptly treated by bathing with warm water and flaxseed poultices, and as soon as there is any evidence of the formation of matter it should be opened. Prompt action in this will often save serious complications. Blisters and irritating liniment should *not* be applied to the throat. When lung complications show themselves the horse should have mustard applied to the belly and to the sides of the chest. When convalescence begins great care must be taken not to expose the animal to cold, which may bring on relapses, and while exercise is of great advantage it must not be turned into work until the animal has entirely regained its strength.—(Spl. Rpt. Horse Dept. Agr. 1911; S. C. A. E. S. B. 25; Va. A. E. S. B. 6.)

INFLUENZA.

(SYNONYMS: Pinkeye, typhoid fever, epizooty, epihippic fever, hepatic fever, bilious fever, etc.)

Influenza is a contagious and infectious specific fever of the horse, ass, and mule, with alterations of the blood, stupefaction of the brain and nervous system, great depression of the vital forces, and frequent inflammatory complications of the important vascular organs, especially of the lungs, intestines, brain, and laminæ of the feet. One attack usually protects the animal from future ones of the same disease, but not always. An apparently complete recovery is sometimes followed by serious sequelæ of the nervous and blood-vessel systems. The disease is very apt, under certain conditions of the atmosphere or from unknown causes, to assume an epizootic form, with tendency to complications of especial organs, as, at one period, the lungs, at another the intestines, etc.

Etiology.—As one attack is self-protective, numbers of old horses, having had an earlier attack, are not capable of contracting it again; but, aside from this, young horses, especially those about four or five years of age, are much more predisposed to be attacked, while the older ones, even if they have not had the disease, are less liable to it. Again, the former age is that in which the horse is brought from the farm, where it has been free from the risk of exposure, and is sold to pass through the stables of the country taverns, the dirty, infected railway cars, and the foul stockyards and damp stables of dealers in our large cities. Want of training is a predisposing cause. Overfed, fat, young horses which have just come through the sales stables are much more susceptible to contagion than the same horses are after a few months of steady work.

The atmosphere is the most common carrier of the infection from sick animals to healthy ones, and through it may be carried for a considerable distance. The contagion will remain in the straw bedding and droppings of the animal and in the feed in an infected stable for a considerable time, and if these are removed to other localities it may be carried in them. It may be carried in the clothing of those who have been in attendance on horses suffering from the disease.

Symptoms.—After the exposure of a susceptible horse to infection a period of incubation of from four to seven days elapses, during which the animal seems in perfect health, before any symptom is visible. When the symptoms of influenza develop they may be intense or they may be so moderate as to occasion but little alarm, but the latter condition frequently exposes the animal to use and to the danger of the exciting causes of complications which would not have happened had the animal been left quietly in its stall in place of being worked or driven out to show to prospective purchasers. The disease may run a simple course as a specific fever, with alterations only of the blood, or it may become at any period complicated by local inflammatory troubles, the gravity of which is augmented by developing in an animal with an impoverished blood and already irritated and rapid circulation and defective nutritive and reparative functions.

The first symptoms are those of a rapidly developing fever, which becomes intense within a very short period. The animal becomes dejected and inattentive to surrounding objects; stands with its head down, and not back on the halter as in serious lung diseases. It has chills of the flanks, the muscles of the croup, and the muscles of the shoulders, or of the entire body, lasting from fifteen to thirty minutes, and frequently a grinding of the teeth which warns one that a severe attack may be expected. The hairs become dry and rough and stand on end. The body temperature increases to 104°, 104.5°, and 105° F., or even in severe cases to 107° F., within the first twelve or eighteen hours. The horse becomes stupid, stands with its head hanging, the ears listless, and it pays but little attention to the surrounding attendants or the crack of a whip. The stupor becomes rapidly more marked, the eyes become puffy and swollen with excessive lachrymation, so that the tears run from the internal canthus of the eye over the cheeks and may blister the skin in its course. The respiration becomes accelerated to twenty-five or thirty in a minute, and the pulse is quickened to seventy, eighty, or even one hundred, moderate in volume and in force. There is great depression of muscular force; the animal stands limp, as if excessively fatigued. There is diminution, or in some cases total loss, of sensibility of the skin, so that it may be pricked or handled without attracting the attention of the animal. On movement, the horse staggers and shows a want of co-ordination of all of the muscles of its limbs. The senses of hearing, sight, and taste are diminished, if not entirely abolished. The visible mucous membranes from which it is known as the pinkeye, and the mouth and the natural openings become of a deep saffron, ocher, or violet-red color. This latter is especially noticeable on the rim of the gums and is a condition not found in any other disease, so that it is an almost diagnostic symptom. In some outbreaks there is much more swelling of the lids and weeping from the eyes than in others. If the animal is bled at this period the blood is found more coagulable than normal, but at a later period it becomes of a dark color and less coagulable. There is great diminution or total loss of appetite with an excessive thirst, but in many cases in cold-blooded horses the animal may retain a certain amount of appetite, eating slowly at its hay, oats, or other feed. There is some irritation of the mucous membrane of the respiratory tract as shown by discharge of mucus from the nose, and by cough. Pregnant mares are apt to abort.

Terminations.—The termination of simple influenza may be death by extreme fever, with failure of the heart's action; from excessive coma, due generally to a rapid congestion of the brain; to the poisonous effects of the debris of the disintegrated blood corpuscles and the toxin of the disease; to an asphyxia, following congestion of the lungs; or the disease terminates by subsidence of the fever, return of the appetite and nutritive functions of the organs, and rapid convalescence; or, in an unfortunately large number of cases, the course of the disease is complicated by local inflammatory troubles, whose gravity is greater in influenza than it is when they occur as sporadic diseases.

Complications.—The complications are congestions, followed by inflammatory phenomena in the various organs of the body, but they are most commonly located in the intestines, lungs, brain, or vascular laminæ of the feet. Atmospheric influence or other surrounding influences of unknown quality seem to be an important factor in the determination of the local lesions.

Complication of the Intestines.—When any cause acts as an irritant to the intestinal tract during the course of this specific fever it may produce inflammation of the organs belonging to it. This cause may be constipation, which can find relief only in a congestion which offers to increase the function of the glands and relieve the inertia caused by a temporary cessation of activity; or irritant medicines, especially any increased use of antimony, turpentine, or the more active remedies; the taking of indigestible food, or of food in too great quantities, or food altered in any way by fungus or other injurious alterations; the swallowing of too cold water; or any other irritant may cause congestion. This complication is ushered in by colics. The animal paws with the fore feet and evinces a great sensibility of the belly; it looks with the head from side to side, and may lie down and get up, not with violence, but with care for itself, perfectly protecting the surface of the belly from any violence. At first we find a decided constipation; the droppings if passed are small and hard, coated with a viscous varnish or even with false membranes. In from thirty-six to forty hours the constipation is followed by diarrhea. The animal becomes rapidly exhausted and unstable, staggers on movement, losing the little appetite which may have remained, and has fever. The pulse becomes softer and weaker, the respiration becomes gradually more rapid, the temperature is about 1° to 1.5° F. higher. If a fatal result is not produced by the extensive diarrhea the discharge becomes arrested in from five to ten days and a rapid recovery takes place.

Complication of the Lungs.—If at any time during the course of the fever the animal is exposed to cold or drafts of air, or in any other way to the causes of repercussion, the lungs may become affected. In the majority of cases, however, after three, four, or five days of the fever, congestion of the lungs commences without any exposure or apparent exciting cause. Unless this congestion of the lungs is soon relieved it is followed by an inflammation constituting pneumonia. This pneumonia, while it is in its essence the same, differs from an ordinary pneumonia at the commencement by an insidious course. The animal commences to breathe heavily, which becomes distinctly visible in the heaving of the flanks, the dilatation of the nostrils, and frequently in the swaying movement of the unsteady body. The respirations increase in number, what little appetite remained is lost, the temperature increases from 1° to 2°, the pulse becomes more rapid, and at times, for a short period, more tense and full, but the previous poisoning of the specific disease has so weakened the tissues that it never becomes the characteristic full, tense pulse of a simple pneumonia.

On percussion of the chest dullness is found over the inflamed areas; on auscultation at the base of the neck over the trachea a tubular murmur is heard. The crepitant rales and tubular murmurs of pneumonia are heard on the sides of the chest if the pneumonia is peripheral, but in pneumonia complicating influenza the inflamed portions are frequently disseminated in islands of variable size and are sometimes deep seated, in which case the characteristic auscultory symptoms are sometimes wanting. From this time on the symptoms of the animal are those of an ordinary grave pneumonia, rendered more severe by occurring in a debilitated animal. The cough is at first hacky and aborted; later, more full and moist and there is discharge from the nostrils. As in simple pneumonia, in the outset this discharge may be rusty, due to capillary hemorrhages. We find that the blood is thoroughly mixed with the matter, staining it evenly, instead of being mixed with it in the form of clots. At the commencement of the complication the animal may be subject to chills, which may again occur in the course of the disease, in which case, if severe, an unfavorable termination by gangrene may be looked for. If gangrene occurs it is shown by preliminary chills, a rapid elevation of temperature, a tumultuous heart, a flaky discharge from the nostrils, and a fetid breath; the symptoms are identical with those which occur in gangrene complicating other diseases.

Complication of the Brain.—At any time during the course of the disease congestion of the brain may occur; at an early period if the fever has been intense from the outset, but in ordinary cases more frequently after three or four days. The animal, which has been stupid, becomes suddenly restless, walks forward in the stall until it fastens its head in the corner. If in a box stall and it becomes displaced from its position, it follows the wall with the nose and eyes, rubbing it along until it reaches the corner and again fastens itself. It may become more violent, and rear and plunge. If disturbed by the entrance of the attendant or any loud noise or bright light, it will stamp with its fore feet and strike with its hind feet, but is not definite in fixing the object which it is resisting, which is a diagnostic point between meningitis and rabies and which renders the animal with the former disease less dangerous to handle. If fastened by a rope to a stake or post, the animal will wander in a circle at the end of the rope. It wanders almost invariably in one direction. The pupils may be dilated or contracted, or we may find one condition in one eye and the opposite in the other.

The period of excitement is followed by one of profound coma, in which the animal is immobile, the head hanging and placed against the corner of the stall, the body limp, and the motion, if demanded of the animal, unsteady. Little or no attention will be paid to the surrounding noises, the crack of a whip, or even a blow on the surface of the body. The respiration becomes slower, the pulsations are diminished, the coma lasts for variable time, to be followed by excesses of violence, after which the two alternate, but if severe the period of coma becomes longer and longer until the animal dies of spasms of the lungs or of heart failure. It may die from injuries which occur in the ungovernable attacks of violence.

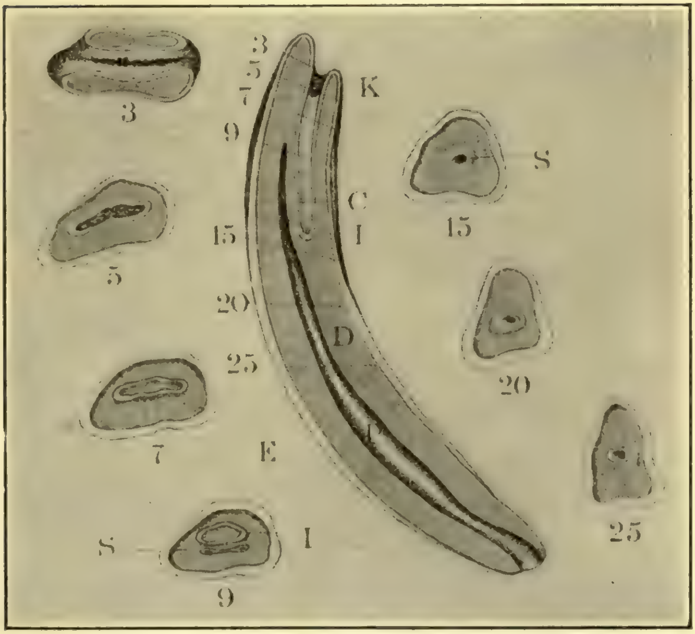
Complication of the Feet.—The feet are the organs which are next in frequency predisposed to congestion. This congestion takes place in the laminæ of the feet. The stupefied animal is roused from its condition by excessive pain in the feet, and assumes the position of a foundered horse; that is, if the fore feet alone are affected they are carried forward until they rest on the heels, and if the hind feet are affected all of the feet are carried forward, resting on their heels, the hind ones as near the center of gravity as possible. In some cases the stupor of the animal is so great that the pain is not felt, and little or no alternation of the position of the animal is noticeable. The foot is found hot to the touch, and after a given time the depressed convex sole of typical founder is recognized.

Pleurisy.—This is a rare complication, but when it does occur it is ushered in by the usual symptoms of depression, rapid pulse, small respiration, elevation of the temperature, subcutaneous edema of the legs and under surface of the belly, and we find a line of dullness on either side of the chest and an absence of respiratory murmur at the lower part. If it is severe there may be an effusion filling one-fourth to one-third of the thoracic cavity in from thirty-six to forty-eight hours.

Pericarditis.—This is an occasional complication of influenza. It is ushered in by chills, elevation of the temperature; the pulse becomes rapid, thready, and imperceptible. The heart murmurs become indistinct or can not be heard. A venous pulse is seen on the line of the jugular veins along the neck. Respiration becomes more difficult and rapid. If the animal is moved the symptoms become more marked, or it may drop suddenly dead from heart failure.

Peritonitis.—This is inflammation of the membranes lining the belly and covering the organs contained in it. The general symp-

Final Bleeding of a Hog. B. A. I. 1910.



Ages of Horses as Indicated by Teeth. Longitudinal Section of Left Central Lower Incisor and Cross Sections of Same Tooth Showing Table Surfaces as They Appear at the Age of 3, 5, 7, 9, 15, 20, and 25 Years. *C*, Cement. *I*, Infundiblum. *D*, Dentine. *K*, Cup. *S*, Star. *E*, Enamel. *P*, Pulp Cavity. Dept. of Agr.

toms are similar to those of a commencing pericarditis. The local symptoms are those of pain, especially to pressure on side of the flanks and belly; distension of the latter, and sometimes the formation of flatus, or gas, and constipation. Other occasional complications are nephritis, hepatitis, inflammation of the flexor tendons and rupture of them, and abscesses.

Diagnosis.—The diagnosis of influenza is based upon continued fever, with great depression and symptoms of stupor and coma; the rapidly developing, dark-saffron, ocher, yellowish discoloration of the mucous membranes, swelling of the legs and soft tissues of the genitals. When these symptoms have become manifested the diagnosis of a local complication is based upon the same symptoms that are produced in the local disease from other causes, but in influenza the local symptoms are frequently masked or even entirely hidden by the intense stupor of the animal, which renders it insensible to pain. The evidence of colic and congestion, which is followed by diarrhea, indicates enteritis. The rapid breathing or difficulty of respiration points to a complication of the lungs, but, as we have seen in the study of the symptoms, the local evidences of lung lesions are frequently hidden. Again, we have seen that inflammation of the feet, or founder, complicating influenza is frequently not shown on account of the insensibility to pain on the part of the animal, which indicates the importance of running the hand daily over the hoofs to detect any sudden elevation of temperature on their surface.

The diagnosis of brain trouble is based upon the excessive violence which occurs in the course of the disease, for during the intervening period of coma there is no means of determining that it is due to this complication. Severe cases of influenza may simulate anthrax in the horse. In both we have stupor, the intense coloration of the mucous membranes of the eyes, and a certain amount of swelling of the legs and under surface of the belly. The diagnosis here can be made only by microscopic examination of the blood. In strangles, equine variola, and scalma we have an intense red, rosy coloration of the mucous membranes, full, tense pulse, and, although in these diseases we may have depression, we do not have the stupor and coma except in severe cases which have lasted for some days. In influenza we have no evidence of the formation of pus on the mucous membranes as in the other diseases, except sometimes in the conjunctivæ of the eyes.

In severe pneumonia we may find profound coma, dark yellowish coloration of the mucous membranes, and swelling of the under surface of the belly and legs; but in pneumonia we have the history of the difficulty of breathing and an acute fever of asthenic type from the outset, and the other symptoms do not occur for several days; while in influenza we have the history of characteristic symptoms for several days before the rapid breathing and difficulty of respiration indicate the appearance of the complication. Without the history it is frequently difficult to diagnose a case of influenza of several days' standing, complicated by pneumonia, from a case of severe pneumonia of five or six days' standing, but from a prognostic point of view it is immaterial, as the treatment of both are identical. The fact that other horses in the same stable or neighborhood have influenza may aid in the diagnosis.

Prognosis.—Influenza is a serious disease chiefly on account of its numerous complications. Uncomplicated influenza is a comparatively simple malady, and is fatal in but 1 to 5 per cent of all cases. In some outbreaks, however, complications of one kind or another preponderate; in such instances the rate of mortality is much increased.

Treatment.—While the appetite remains the patient should have a moderate quantity of sound hay, good oats, and bran; or even a little fresh clover, if obtainable, can be given in small quantities. It is not so important that a special diet shall be observed as that the horse shall eat a moderate quantity of nourishing food, and he may be tempted with any food of good quality that he relishes. The sick horse should be placed in a well-ventilated box stall away from other horses. Grass, roots, apples, and milk may be offered and, if relished, allowed freely. To reduce the temperature, the safest simple plan is to inject large quantities of cold water into the rectum. Antipyrene may be used with alcohol or strychnia. Derivatives in the form of essential oils and mustard poultices, baths of alcohol, turpentine, and hot water, after which the animal must be immediately dried and blanketed, serve to waken the animal up from the stupor and relieve the congestion of the internal organs. This treatment is especially indicated when complication by congestion of the lungs, intestines, or of the brain is threatened. Quinine and salicylic acid in 1-dram doses will lower the temperature, but too continuous use of quinine in some cases increases the after depression. Iodide of potash reduces the excessive nutrition of the congested organs and thereby reduces the temperature; again, this drug in moderate quantities is a stimulant to the digestive tract and acts as a diuretic, causing the elimination of waste matter by the kidneys. Small doses of Glauber's salts and bicarbonate of soda, used from the outset, stimulate the digestive tract and prevent constipation and its evil results.

In cases of severe depression and weakness of the heart digitalis can be used with advantage. At the end of the fever, and when convalescence is established, alcohol in one-half pint doses and good ale in 1-pint doses may be given as stimulants; to these may be added 1-dram doses of turpentine.

In complication of the intestines camphor and asafetida are most frequently used to relieve the pain causing the colics; diarrhea is also relieved by the use of bicarbonate of soda, nitrate of potash, and drinks made from boiled rice or starch, to which may be added small doses of laudanum.

In complication of the lungs iodide of potash and digitalis are most frequently indicated, in addition to the remedies used for the disease itself.

Founder occurring as a complication of influenza is difficult to treat. It is, unfortunately, frequently not recognized until inflammatory changes have gone on for some days. If recognized at once, local bleeding and the use of hot or cold water, as the condition of the animal will permit, are most useful, but in the majority of cases the stupefied animal is unable to be moved satisfactorily or to have one foot lifted for local treatment, and the only treatment consists in local bleeding above the coronary bands and the application of poultices.

During convalescence small doses of alkalines may be kept up for some little time, but the greatest care must be used, while furnishing the animal with plenty of nutritious, easily digestible food, not to overload the intestinal tract, causing constipation and consequent diarrhea. Special care must be taken for some weeks not to expose the animal to cold.—(Spl. Rpt. Horse Dept. Ag. 1911.)

ANASARCA, OR PURPURA HEMORRHAGICA.

A previous attack of influenza is a common predisposing cause of this disease, which appears most frequently a few weeks after convalescence is established. It occurs more frequently in those animals which have made a rapid convalescence and are apparently perfectly well than it does in those which have made a slower recovery. Anasarca commences by symptoms which are excessively variable. The local lesions may be confined to a small portion of the animal's body and the constitutional phenomena be nil. The appearance and gravity of the local lesions may be so unlike, from difference of location, that they seem to belong to a separate disease, and complications may completely mask the original trouble.

In the simplest form the first symptom noticed is a swelling, or several swellings, occurring on the surface of the body—on the forearm, the leg, the under surface of the belly, or the side of the head. The tumefaction is at first the size of a hen's egg; not hot, little sensitive, and distinctly circumscribed by a marked line from the surrounding healthy tissue. These tumors gradually extend until they coalesce, and in a few hours we have swelling up of the legs, legs and belly, or the head, to an enormous size; they have always the characteristic constricted border, which looks as if it had been tied with a cord. In the nostrils are found small reddish spots, which gradually assume a brownish and frequently a black color. Examination of the mouth will frequently reveal similar lesions on the surface of the tongue, along the lingual gutter, and on the frænum. If the external swelling has been on the head, the petechiæ of the mucous membranes are apt to be more numerous and to coalesce into patches of larger size than when the dropsy is confined to the legs. The animal may be rendered stiff by the swelling of the legs, or be annoyed by the awkward swollen head, which at times may be so enormous as to resemble that of a hippopotamus rather than that of a horse. During this period the temperature remains normal; the pulse, if altered at all, is only a little weaker; the respiration is only hurried if the swelling of the head infringes on the caliber of the nostrils. The appetite remains normal. The animal is attentive to all that is going on, and, except for the swelling, apparently in perfect health.

In from two to four days, in severe cases, the tissues can no longer resist the pressure of the exuded fluid. Over the surface of the skin which covers the dropsy we find a slight serous sweating, which loosens the epidermis and dries so as to simulate the eruption of some cutaneous disease. If this is excessive we may see irritated spots which are suppurating. We may now find some enlargement of the lymphatic glands, which are fed from the affected part. The thermometer indicates a slight rise in the body temperature, while the pulse and respiration are somewhat accelerated. The appetite usually remains good. In the course of a few days the temperature may have reached 102°, 103°, or 104° F.

Fever is established, not an essential or specific fever in any way, but a simple secondary fever produced by the dead material from the surface or superficial suppuration, and by the oxidization and absorption of the colloid mass contained in the tissues. The skin may suppurate or slough more or less over the areas of greatest tension or where it is irritated by blows or pressure. The great swelling about the head may by closure of the nostrils interfere seriously with breathing. Internal edema may occur in the throat, lungs, or intestines. Septicemia, or blood poisoning, may result from anasarca.

Terminations.—The simple form of the disease most frequently terminates favorably on the eighth or tenth day by resolution or absorption of the effusion, with usually a profuse diuresis, and with or without diarrhea. The appetite remains good or is at times capricious. Death may occur from mechanical asphyxia, produced by the closure of the nostrils or closure of the glottis. Metastasis to the lungs is almost invariably fatal, causing death by asphyxia. Metastasis to the intestines may cause death from pain, enteritis, or hemorrhage. Excessive suppuration, lymphangitis, and gangrene are causes of a fatal termination by exhaustion. Mortal exhaustion is again produced by inability to swallow in cases of excessive swelling of the head. Peritonitis may arise secondary to the enteric edema, or by perforation of the stomach or intestines by a gangrenous spot. Septicemia terminates fatally with its usual train of symptoms.

Alterations.—The essential alterations of anasarca are exceedingly simple; the capillaries are dilated, the lymphatic spaces between the fibers of the connective tissue are filled with serum, and the coagulable portion of the blood presents a yellowish or citrine mass, jellylike in consistency, which has stretched out the tissue like the meshes of a sponge. Where the effusion has occurred between the muscles, as in the head, these are found dissected and separated from each other like those of a hog's head by the masses of fat. The surface of the skin is desquamated and frequently denuded of the hair. Frequently there are traces of suppuration and of ulceration. The mucous membrane of the nose is found studded with small, hemorrhagic spots, sometimes red, more frequently brown or black, often coalesced with each other in irregular-sized patches and surrounded by a reddish zone, the product of irritation. If edema of the intestines has occurred, the membrane is found four or five times its normal thickness, reddish in color, with hemorrhages on the free surface. Edema of the lungs leaves these organs distended. The secondary alterations vary according to the complications. There are frequently the lesions of asphyxia; externally we find ulcers, abscesses, and gangrenous spots and the deep ulcers resulting from the latter. The lymphatic cords and glands are found with all the lesions of lymphangitis. Again are found the traces of excessive emaciation, or the lesions of septicemia. Except from the complications the blood is not altered in anasarca.

Diagnosis.—The diagnosis of anasarca must principally be made from farcy or glanders. In anasarca the swelling is nonsensitive, while sensitive in the acute swelling of farcy. The nodes of farcy are distinct and hard and never circumscribed, as in the other disease. The eruption of glanders on the mucous membranes is nodular, hard, and pelletlike. The redness disappears on pressure. In case of excessive swelling of the head in anasarca, there may occur an extensive serofibrinous exudation from the mucous membranes of the nose, poured out as a semifluid mass or as a cast of the nasal fossæ, never having the appearance or typical oily character which it has in glanders. The inflammation of the lymphatic cords and glands in anasarca does not produce the hard, indurated character which is found in farcy.

Prognosis.—While anasarca is not an excessively fatal disease, the prognosis must always be guarded. The majority of cases run a simple course and terminate favorably at the end of eight or ten days, or possibly, after one or two relapses, requiring several weeks for complete recovery. Effusion into the head renders the prognosis much more grave from the possible danger of mechanical asphyxia. Threatened mechanical asphyxia is especially dangerous on account of the risk of blood poisoning after an operation of tracheotomy. Edema of the viscera is a most serious complication. The prognosis is based on the complications, their extent, and their individual gravity, existing, as they do here, in an already debilitated subject.

Treatment.—The treatment of anasarca may be as variable as are the lesions. The indications are at once shown by the alterations and mechanism of the disease, which we have just studied. Hygiene comes into play as the most important factor. Oats, oat and hay tea, milk, eggs—anything which the stomach or rectum can be coaxed to take care of—must be employed to give the nutriment, which is the only thing that will permanently strengthen the tissues, and they must be strengthened in order to keep the capillaries at their proper caliber.

Laxatives, diaphoretics, and diuretics must be used to stimulate the emunctories, so that they shall carry off the large amount of the products of decomposition which result from the stagnated effusions of anasarca. Of these the sulphate of soda in small repeated doses, and the nitrate of potash and bicarbonate of soda in small quantity, and the chlorate of potash in single large doses will be found useful. Stimulants and astringents are directly indicated. Spirits of turpentine serves the double purpose of a cardiac stimulant and a powerful, warm diuretic, for the kidneys in this disease will stand a wonderful amount of work. Camphor can be used with advantage. Coffee and tea are two of the diffusible stimulants which are too much neglected in veterinary medicine; both are valuable adjuncts in treatment in anasarca, as they are during convalescence at the end of any grave disease which has tended to render the patient anemic. Dilute sulphuric acid and hydrochloric acid are perhaps the best examples of a combination of stimulant, astringent, and tonic which can be employed. The simple astringents of mineral origin, sulphates of iron, copper, etc., are useful as digestive tonics. The vegetable astringents, tannic acid, etc., have not proved efficacious. Iodide of potash in small doses serves the triple purpose of digestive tonic, denutritive for inflammation, and diuretic. Among the newer forms of treatment are diluted Lugol's solution injected into the trachea, antistreptococcus and colloidal silver solution injected into the circulation. No one but a qualified veterinarian would be competent to apply these remedies.

Externally.—Sponging the swollen parts, especially the head, when the swelling occurs there, is most useful. The bath should be at an extreme of temperature—either ice cold to constrict the tissues or hot water to act as an emollient and to favor circulation. Vinegar may be added as an astringent. When we have excessively denuded surfaces, suppuration, or open wounds, disinfectants should be added to the wash.

In cases of excessive swelling, especially of the head, mechanical relief may be required. Punctures of the part should be made with the hot iron even in country practice, as no other disease so predisposes to septic contamination. When mechanical asphyxia is threatened tracheotomy may be demanded. With the first evidence of dyspnea, not due to closing of the nostrils or glottis, or with the first pawing which gives rise to a suspicion of colic, a mustard plaster should be applied over the whole belly and chest. The sinapism will draw the current of the circulation to the exterior, the metastasis to the lungs or intestines is prevented, and the enfeebled nervous system is stimulated to renewed vigor by the peripheral irritation. The organs are encouraged by it to renewed functional activity; the local inflammation produced by it favors absorption of the exudation. The objection to the use of blisters is their more severe action and the danger of mortification. Septicemia, when occurring as a complication, requires the ordinary treatment for the putrid diseases, with little hope of a good result. After recovery the animal regains its ordinary health, and there is no predisposition to a return of the disease. —(Spl. Rpt. Horse, Dept. Agr. 1911.)

EDEMATOUS PNEUMONIA.

(SYNONYMS: Contagious pneumonia; adynamic pneumonia; hospital, or stable, pneumonia; equine pleuro-pneumonia; influenza; pleuro-pneumonia.)

This disease is the adynamic pneumonia of the older veterinarians, who did not recognize any essential difference in its nature from an ordinary inflammation of the lungs, except in the profound sedation of the force of the animal affected with it, which is a prominent symptom from the outset of the disease. Again, this same prostration of the vital force of the animal, combined with the staggering movement and want of co-ordination of the muscles of the animal, caused it for a long time to be confounded with influenza, with which at certain periods it certainly has a strong analogy of symptoms, but from which, as from sporadic pneumonia, it can be separated very readily if the case can be followed throughout its whole course. Edematous pneumonia is a specific inflammation of the lungs. It causes a profound sedation of the nervous system, which may be so great as to cause death. It is sometimes attended by pleurisy, inflammation of the heart, or septic complications which also prove fatal.

Etiology.—While, as an infectious disease, its original cause is due to a specific virus, there are many predisposing causes which act as important factors in aiding in its development. Such causes are any influences that lessen the general vigor. Old, cold, damp, foul, unclean, and badly drained and ventilated stables allow rapid dissemination of the disease to other horses in the same stable and act as rich reservoirs for preserving the contagion, which may be retained for over a year. The virus is but moderately volatile, and in a stable seems rather to follow the lines of the walls and irregular courses than the direct currents of air and the tracts of ventilation. A brick wall 8 feet in height served, in one instance, to prevent the infection of other animals placed on the opposite side from a horse ill with the disease, while others placed on the same side and separated from the focus of contagion only by open bars in the stall were infected and developed the disease in its typical form.

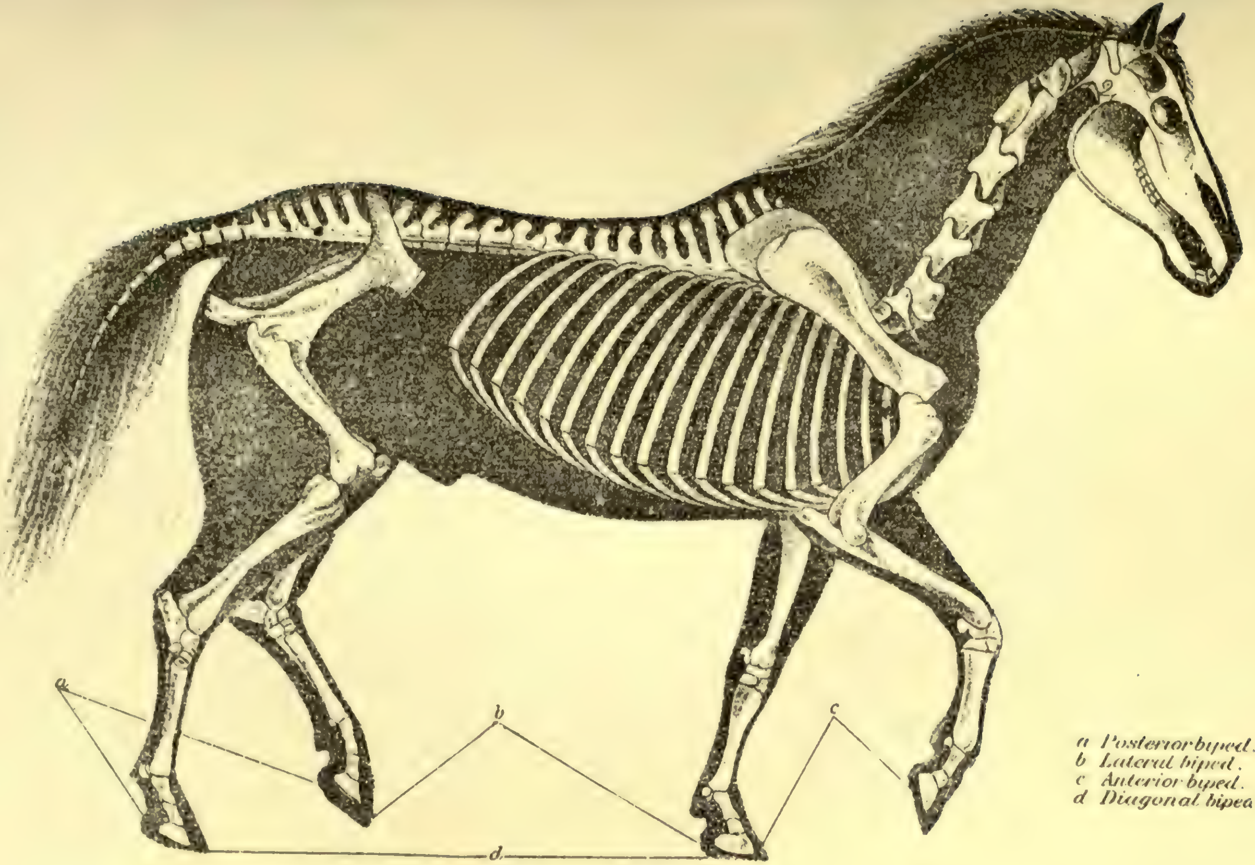
Symptoms.—The symptoms differ slightly from those of a frank, fibrinous pneumonia, but not so much by the introduction of new symptoms as by the want of or absence of the distinct evidences of local lesions which are found in the latter disease. All of the pneumonias throughout the whole course of the trouble are less marked and less clearly defined.

The symptoms may develop slowly or rapidly. If slowly, there is fever and the animal gives a rare cough which resembles that of a heavy horse affected with a slight chronic bronchitis; it becomes somewhat dejected and dull, at times somnolent, and has a diminished appetite. This condition lasts for several days, or the disease may begin with high fever, and the symptoms described below are severe and develop in rapid sequence. The respiration increases to 24, 30, or 36 to the minute, and a small, running, soft pulse attains a rhythm of 50, 70, or even more beats in the sixty seconds. The heart, however, contrary to the debilitated condition of the pulse, is found beating violently and tumultuously, like it does in anthrax and septic intoxication. The mucous membranes of the eyes and mouth and of the genital organs are found somewhat edematous, and they rapidly assume a dirty, saffron color, at times approaching an ocher, but distinguishable from the similar coloration in influenza by the want of the luster belonging to the latter and by the muddy, dull tint, which is characteristic throughout the disease.

Suddenly, without the preliminary rales which precede grave lesions of the lungs in other diseases, the blowing murmur of pneumonia is heard over a variable area of the chest, usually, however, much more distinctly over the trachea at the base of the neck and directly behind the shoulder on either side of the chest. In some cases the evidence of lung lesion can only be detected over the trachea. The lesions of the lungs may be scattered through both lungs, involving numerous small areas, or they may be confined to and more or less fully occupy one or two lobes. Occasionally there is a general involvement of both lungs. The body temperature has now reached 104° or 105° F., or in extreme cases even a degree higher. The debility of the animal is great without the stupefaction or evidence of cerebral trouble, which is constant with such grave constitutional phenomena in influenza or severe pneumonias. The animal is subject to occasional chills, and on movement staggers in its gait. The yellow coloration of the visible mucous membrane is rendered pale by infiltration of the liquid of the blood into the tissues; the pulse may become so soft as to be almost imperceptible, the heart movement and sounds being at the same time exaggerated. The animal loses flesh rapidly, and dropsies of the extremities, of the under surface of the belly, or of the internal organs may show themselves.

Terminations.—These symptoms may gradually subside after five to eight days, with an improved appetite the inanition may cease and the animal commence to nourish its impoverished blood and tissues; the pulse becomes stronger and the heart more regular and less tumultuous; the mucous membranes assume a brighter and more distinct color; the difficulty of respiration is removed, and the animal may make a recovery. When death occurs it is usually directly due to heart failure; in some cases it is caused by asphyxia, owing to the great amount of exudation into the lung tissue, rendering its further function impossible.

Complications.—The pulmonary complications of edematous pneumonia are secondary inflammatory or necrotic changes in the lungs themselves. Suppuration at times takes place in the bronchi and may extend to the lung tissue. In this case mucous rales develop which are most distinctly heard over the trachea and on the sides of the chest directly behind the shoulders. With the development of the mucous rales, to be heard on auscultation, we have a more purulent discharge from the nostrils, similar to that of a chronic or subacute bronchitis. If the inflammation has been of some standing, cavernous rales may be heard indicating the destruction of a considerable portion of lung tissue and the formation of a cavity. Gangrene sometimes occurs. A sudden rise of the body temperature of 1° or 2°, with a more enfeebled pulse and a still more tumultuous heart, develop simultaneously with the appearance of a discharge from the nostrils. This discharge is gray in color, serous or watery in consistency, mixed with the detritus of broken-down lung tissue, and sometimes contains clots of blood, or in more serious cases may be marked by a quantity of fluid blood from a hemorrhage, which proves fatal. The discharge is fetid to the smell. The animal emaciates rapidly. On examination of the lungs mucous rales are heard in the larger bronchi, cavities may be found at any part of these organs, and points of lobular pneumonia may be detected.



a Posterior biped.
b Lateral biped.
c Anterior biped.
d Diagonal biped

SKELETON OF HORSE.

A very serious complication is an inflammation of the heart muscle. This is shown by a very weak and rapid pulse, great prostration, some filling of the lungs. This complication nearly always terminates in death. Other complications which may be mentioned are inflammation of the kidneys, blood poisoning, congestion of the brain, and inflammation of the tendinous sheaths and the tendons of the legs.

Diagnosis.—As fever is the first symptom of edematous pneumonia, it is useful during an outbreak of this disease to make daily temperature measurements of the exposed horses, so that the first indication of disease may be discovered and the horse removed from contact with those that are sound.

Prognosis.—The mortality in this disease may be as high as 25 per cent, but it is usually not more than 10 per cent. If there is a special tendency to complications of some sort, the mortality is increased.

Treatment.—Bleeding is not to be used because it would only still further weaken an already enfeebled animal; antimony or the alterants would increase the depression of a too depraved constitution. There is in this disease no acute congestion of a particular organ to draw off by depletive measures, nor any violent blood current to be retarded, for fear of hypernutrition of any special part.

Revulsives do good, as they excite the nervous system and awaken the torpor of the weakened blood vessels, which aid in the reestablishment of the functions. Mustard poultices may be applied over the belly and sides of the chest, as in other diseases, but caution must be used in the employment of blisters, as ugly ulcers may result from their action on a tissue of weakened vitality. Setons are dangerous from the great tendency in this disease to septic complications. Repeated friction of the legs by hand-rubbing and warmth by bandaging and by rubbing the surface of the body with turpentine and alcohol, which is immediately to be dried by rough towels, will excite the circulation and stimulate the emunctories of the skin.

Stimulants are given internally from the outset of the disease. Turpentine in 1-dram doses regulates the heart and excites the kidneys to carry off waste matter, but if repeated too frequently may disturb the already delicate digestive system. Alcohol rectifies the latter danger, and is a useful stimulant to the heart and digestive system, if given with care in small doses. It is an antiputrid, and is specially indicated when septic complications and gangrene are present. The aromatics and bitter tonics are useful; gentian and tea in warm decoction form a useful menstruum for other remedies. Digitalis is a useful remedy. Strychnine and quinine may be given throughout almost the whole course of the disease. The various preparations of iron are astringents and excitants to the digestive system. Carbolic acid is an antiputrid which is of marked benefit in edematous pneumonia; it should be given in small doses diluted in alcohol.

Salicylic acid may be given in 1 or 2 dram doses every few hours. It is much used for troubles of the serous membranes, lowers the temperature, and is of value in this disease in preventing the exudation into the tissue of the lungs. The alkalines, as the sulphate and bicarbonate of soda, the nitrate of potash, and very small doses of the iodide of potash, should be employed to regulate the digestive tract, the kidneys, and the other excreting glands, and to stimulate absorption of the waste matter.

The diet demands the strictest attention from the outset. In many of the fevers the food has to be diminished in quantity and regulated in the quality of its heat-producing components during the acute part of the disease, so as to lessen the material for combustion in the inflamed organs. In edematous pneumonia, on the contrary, all the food that can possibly be digested and assimilated must be given. Choice must be made of the richest material which can be handled by the weakened stomach and intestines without fatiguing them. Good, sound hay should be chopped short and dampened or partly boiled; in the latter case the hay tea can be reserved to use as a drink. Oats may be preferred dry or in other cases will be taken better scalded; in most cases, however, it is better to give slops of oatmeal, to which can be added a little bran, barley flour, or boiled milk and wheat flour. Pure cow's milk, not too rich in fatty matter, can be given alone or with beaten eggs; frequently the horse will have to be coaxed with the milk diluted with several parts of water at first, but will soon learn to drink the pure milk. Apples and carrots cut up raw or boiled are useful, and fresh clover in small quantities will frequently stimulate the appetite. In other words, try various foods and combinations and give the horse what he will eat. Throughout the course of the disease and during convalescence the greatest attention must be taken to cleaning the coat thoroughly so as to keep the glands of the skin in working order, and light, warm covering must be used to protect the animal from cold or drafts of air.—(Spl. Rpt. Horses Dept. Agr. 1911.)

GLANDERS AND FARCY.

Let it be understood at the outset that glanders and farcy are one and the same disease, differing only in that the first term is applied to the disease when the local lesions predominate in the internal organs, especially in the nostrils, lungs, and air tubes, and that the second term is applied to it when the principal manifestation is an outbreak of the lesions on the exterior or skin of the animal. The term glanders applies to the disease in both forms, while the term farcy is limited to the visible appearance of external trouble only; but in the latter case internal lesions always exist, although they may not be evident.

Glanders is a contagious constitutional disease of the genus *Equus* (the horse, ass, and mule), readily communicable to man, the dog, the cat, the rabbit, and the guinea pig. It is transmitted with difficulty to sheep and goats, and cattle seem to be entirely immune. It runs a variable course and usually produces the death of the animal affected with it. It is characterized by the formation of neoplasms, or nodules, of connective tissue, which degenerate into ulcers, from which exude a peculiar discharge. It is accompanied by a variable amount of fever, according to the rapidity of its course. It is subject to various complications of the lymphatic glands, of the lungs, of the testicles, of the internal organs, and of the subcutaneous connective tissue.

Glanders was imported into America at the close of the eighteenth century, and before the end of the first half of the last century had spread to a considerable degree among the horses of the Middle and immediately adjoining Southern States. This disease was unknown in Mexico until carried there during the Mexican war by the badly diseased horses of the United States Army. During the first half of the last century a large body of veterinarians and medical men protested against the contagious character of this disease, and prevailed by their opinion to such an extent against the common opinion that several of the governments of Europe undertook a series of experiments to determine the right between the contesting parties.

When we come to study the etiology of glanders, the difference of susceptibility on the part of different species of animals, or even on the part of individuals of the same species, and when we come to find proof of the slow incubation and latent character of the disease as it exists in certain individuals, we will understand how in a section of country containing a number of glandered animals others can *seem* to contract and develop the disease without having apparently been exposed to contagion.

Causes.—The contagious nature of glanders, in no matter what form it appears, being today definitely demonstrated, we can recognize but one cause for all cases, and that is contagion by means of the specific virus of the disease. The causative organism is known as the *Bacillus mallei.* In studying the writings of the older authors on glanders, and the works of those authors who contested the contagious nature of the disease, we find a large number of predisposing causes assigned as factors in the development of the malady.

While a virus from a case of glanders if inoculated into an animal will inevitably produce the disease, we find a vast difference in the contagious activity of different cases of glanders. We find a great variation in the manner and rapidity of the development of the disease in different individuals and that the contagion is much more apt to be carried to sound animals under certain circumstances than it is under others. Only certain species of animals are susceptible of contracting the disease, and while some of these contract it as a general constitutional malady, in others it only develops as a local sore.

In acute glanders the contagion is found in its most virulent form, as is shown by the inevitable infection of susceptible animals inoculated with the disease, while the discharge from chronic semi-latent glanders and farcy may at times be inoculated with a negative result; again, in acute glanders, as we have a free discharge, a much greater quantity of virus-containing matter is scattered in the neighborhood of an infected horse to serve as a contagion to others than is found in the small amount of discharge of the chronic cases.

The chances of contagion are much greater when sound horses, asses, or mules are placed in the immediate neighborhood of glandered horses, drink from the same bucket, stand in the next stall or work in the same wagon, or are fed from feed boxes or mangers which have been impregnated by the saliva and soiled by the discharge of sick animals. Transmission occurs by direct contact of the discharges of a glandered animal with the tissues of a sound one, either on the exterior, when swallowed mixed with food into the digestive tract, or when dried and inhaled as dust.

The stable attendants serve as one of the most common carriers of the virus. Dried or fresh discharges are collected from the infected animal in cleaning, harnessing, feeding, and by means of the hands, clothing, the teeth of the currycomb, the sponge, the bridle, and the halter, and are thus carried to other animals. An animal affected with chronic glanders in a latent form is moved from one part of the stable to another, or works hitched with one horse and then with another, and may be an active agent in the spreading of the disease without the cause being recognized.

Glanders is found frequently in the most insidious forms, and we recognize that it can exist without being apparent; that is, it may affect a horse for a long period without showing any symptoms that will allow even the most experienced veterinarian to make a diagnosis. An old gray mare belonging to a tavern keeper was reserved for family use with good care and light work for a period of eight years, during which time other horses in the tavern stable were from time to time affected with glanders without an apparent cause. The mare, whose only trouble was an apparent attack of heaves, was sold to a huckster who placed her at hard work. Want of feed and overwork and exposure rapidly developed a case of acute glanders, from which the animal died, and at the autopsy were found the lesions of an acute pneumonia of glanders grafted on chronic lesions, consisting of old nodules which had undoubtedly existed for years.

Public watering troughs and the feed boxes of boarding stables and tavern stables of market towns are among the most common recipients for the virus of glanders, which is most dangerous in its fresh state, but cases have been known to be caused by feeding animals in the box or stall in which glandered animals have stood several months before. While the discharge from a case of chronic glanders is much less apt to contain many active bacilli than that from a case of acute glanders, the former, if it infects an animal, will produce the same disease as the latter. It may assume from the outset an acute or chronic form, according to the susceptibility of the animal infected, and this does not depend upon the character of the disease from which the virus was derived.

There is found a much greater receptivity to contract glanders, in the ass and mule than is found in the horse. In the ass and mule in almost all cases the period of incubation is short and the disease develops in an acute form. It is found that the kind of horse infected has an influence on the character of the disease; in full-blooded fat horses of a sanguinary temperament, the disease usually develops in an acute form, while in the lymphatic, cold-blooded, more common race of horses the disease usually assumes a chronic form. If the disease develops first in the chronic form in a horse in fair condition, starvation and overwork are apt to bring on an acute attack, but when the disease is inoculated into a debilitated and impoverished animal it is apt to start in the latent form. Inoculation on the lips or the exterior of the animal is frequently followed by an acute attack, while infection by ingestion of the virus and inoculation by means of the digestive tract is often followed by the trouble in the chronic latent form.

The primary lesion in any form is a local point in which occurs a rapid proliferation of the cell elements which make up the animal tissue with formation of new connective tissue, with a crowding together of the elements until their own pressure on each other cuts off the circulation and nutrition, and death takes place in them in the form of ulceration or gangrene. Following this primary lesion we have an extension of infection by means of the spread of the bacilli into those tissues immediately surrounding the first infected spot, which are most suitable for the development of simple inflammatory phenomena or the specific virus. The primary symptoms are the result of specific reaction at the point of inoculation, but at a later time the virus is carried by means of the blood vessels and lymphatic vessels to other parts of the body and becomes lodged at different places and develops in them; again, when the disease has existed in the latent form in the lungs of the animal and the virus is awakened into action from any cause, we have it carried to various parts of the body and developing in the most susceptible regions or organs. The points of development are most frequently determined by the activity of the circulation and the effects of exterior irritants. For example, if a horse which has been so slightly affected with the virus of glanders that no symptoms are visible is exposed to cold, rain, or sleet, or by the rubbing of the harness on the body and the irritation of mud on the legs, the disease is apt to develop on the exterior in the form of farcy, while a full-blooded horse which is employed at speed and has its lungs and respiratory tract gorged with blood from the extreme use of these organs will develop glanders as the local manifestation of the disease in the respiratory tract.

The previous reference to the existence of glanders under the two forms more commonly differentiated as glanders and as farcy, and our reference to the various conditions in which it may exist as acute, chronic, and latent, show that the disease may assume several different phases. Without losing sight for a moment of the fact that all of these varied conditions are identical in their origin and in their essence, for convenience of study glanders may be divided into three classes—chronic farcy, chronic glanders, and acute glanders with or without farcy.

Chronic Farcy—Symptoms.—In farcy the symptoms commence by formation of little nodes on the under surface of the skin, which rapidly infringe on the tissues of the skin itself. These nodes, which are known as farcy buds and farcy buttons, are from the size of a bullet to the size of a walnut. They are hot, sensitive to the touch, at first elastic and afterwards become soft; the tissue is destroyed, and infringing on the substance of the skin the disease produces an ulcer, which is known as a chancre. This ulcer is irregular in shape, with ragged edges which overhang the sore; it has a gray, dirty bottom and the discharge is sometimes thin and sometimes purulent; in either case it is mixed with a viscous, sticky, yellowish material like the white of an egg in consistency and like olive oil in appearance. The discharge is almost diagnostic; it resembles somewhat the discharge which we have in greasy heels and in certain attacks of lymphangitis, but to the expert the specific discharge is characteristic. The discharge accumulates on the hair surrounding the ulcer and over its surface and dries, forming scabs which become thicker by successive deposits on the under surface until they fall off, to be replaced by others of the same kind; and the excess of discharge may drop on the hairs below and form similar brownish yellow crusts. The farcy ulcers may retain their specific form for a considerable time—days or even weeks—but eventually the discharge becomes purulent in character and assumes the appearance of healthy matter. The surface of the gangrenous bottom of the ulcer is replaced by rosy granulations, the ragged edges are beveled off, and the chancre is turned into a simple ulcer which rapidly heals.

The farcy buttons occur most frequently on the sides of the lips, the sides of the neck, the lower part of the shoulders, the inside of the thighs, or the outside of the legs, but may occur on any part of the body. There is next an irritation of the lymphatic vessels in the neighborhood of the chancres. Those become swollen and then indurated and appear like great ridges underneath the skin; they are hot to the touch and sensitive. The cords may remain for a considerable time and then gradually disappear, or they may ulcerate like a farcy bud itself, forming elongated, irregular, serpentine ulcers with a characteristic, dirty, gray bottom and ragged edges, and pour out a viscous, oily discharge like the chancres themselves.

The essential symptoms of farcy are, as above described, the button, the chancre, the cord, and the discharge. We have in addition to these symptoms a certain number of accessory symptoms, which, while not diagnostic in themselves, are of great service in aiding the diagnosis in cases where the eruption takes place in small quantities, and when the ulcers are not characteristic.

Bleeding from the nose without previous work or other apparent cause, is one of the frequent concomitant symptoms in glanders, and such a hemorrhage from the nostrils should always be regarded with suspicion. The animal with farcy frequently develops a cough, resembling much that which we find in heaves—a short, dry, aborted, hacking cough, with little or no discharge from the nostrils. With this is found an irregular movement of the flanks, and on auscultation of the lungs we find sibilant or at times a few mucous rales. Another common symptom is a sudden swelling of one of the hind legs; it is found suddenly swollen in the region of the canon, the enlargement extending below to the pastern and above as high as the stifle. This swelling is hot and painful to the touch, and renders the animal stiff and lame. On pressure with the finger the swelling can be indented, but the pits so formed soon fill up again on removal of the pressure. In severe cases there may be ulceration of the skin, and serum pours out from the surface, resembling the oozing which we have after a blister or in a case of grease. This swelling is not to be confounded with the stocking in lymphatic horses or the edema which is found in chronic heart or in kidney trouble, as in the last the swelling is cool and not painful and the pitting on pressure remains for sometime after the latter is withdrawn. It is not to be confounded with greasy heels. In these the disease commences in the neighborhood of the pastern and gradually extends up the leg rarely passing beyond the neighborhood of the hock. The swollen leg in glanders almost invariably swells for the entire length in a single night or within a very short period. When greasy heels are complicated by lymphangitis there is a condition very much resembling that of farcy. The swelled leg in farcy is frequently followed by an outbreak of the farcy buttons and ulcers over its surface. In the entire horse the testicles are frequently swollen and hot and sensitive to the touch, but they have no tendency to suppuration. The acute inflammation is rapidly followed by the specific induration, which corresponds to the local lesions in other parts of the body. Chronic farcy in the ass and mule is an excessively rare condition, but sometimes occurs.

Chronic Glanders—Symptoms.—In chronic glanders there is found the same train of inflammatory phenomena, varying in appearance from those of chronic farcy only by the difference of the tissues in which they are located. In chronic glanders there is first the nodule, from the size of a shot to that of a small pea, which forms in the mucous membranes of the respiratory tract. This may be just inside of the wings of the nostrils or on the septum which divides the one nasal cavity from the other and be easily detected, or it may be higher in the nasal cavities on the turbinated bones, or it may form in the larynx itself or on the surface of the trachea or deep in the lungs.

The nodules, which are first red and hard and consist of new connective tissue, soon soften and become yellow; the yellow spots break and there appears a small ulcer the size of the preceding nodule, which has a gray, dirty bottom and ragged edges and is known as chancre. This ulcer pours from its surface a viscous, oily discharge similar to that which was seen in the farcy ulcer. The irritation of the discharge may ulcerate the lining mucous membrane of the nose, causing serpentine gutters with bottoms, resembling those of the chancres themselves. If the nodules have formed in large numbers, they may be causing an acute inflammation of the Schneiderian membrane, with a catarrhal discharge which may mark the specific discharge, or that which comes from the ulcers and resembles the discharge of strangles or simple inflammatory diseases.

The eruption of the ulcers and discharge soon cause an irritation of the neighboring lymphatics; and in the intermaxillary space, deep inside of the jaws, is found an enlargement of the glands, which for the first few days may seem soft and edematous, but which rapidly becomes confined to the glands, these being from the size of an almond to that of a small bunch of berries, exceedingly hard and nodulated. This enlargement of the glands is found high up on the inside of the jaws, firmly adherent to the base of the tongue. It is not to be confounded with the puffy, edematous swelling, which is not separated from the skin and subcutaneous connective tissues found in strangles, in laryngitis, and in other simple inflammatory troubles.

These glands bear a great resemblance to the hard, indurated glands which are found in connection with the collection of pus in the sinuses; but in the latter disease the glands have not the extreme nodulated feel which they have in glanders. With the glands are found indurated cords, feeling like balls of tangled wire or twine, fastening the glands together.

The essential symptoms of glanders are the nodule, the chancre, the glands, and the discharge. With the development of the nodules in the respiratory tract, according to their number and the amount of eruption which they cause there may be found a cough which resembles that of a coryza, a laryngitis, a bronchitis, or a broncho-pneumonia, according to the location of the lesions. In chronic glanders there is found the same accessory symptoms that occur in chronic farcy, the hemorrhage of the nose, the swelling of the legs, the chronic cough, and, in the entire horse, the swelling of the testicles.

On healing, the chancres on the mucous membranes leave small, whitish, star-shaped scars, hard and indurated to the touch, and which remain for almost an indefinite time. The chancres heal and the other local symptoms disappear, with the exception of the enlargement of the glands, and one finds these so diminished in size that they are scarcely perceptible on examination. During the subacute attacks, with a minimum quantity of local troubles, in chronic glanders and in chronic farcy the animal rarely shows any amount of fever, but does have a general depraved appearance; it loses flesh and becomes hide-bound; the skin becomes dry and the hairs stand on end. There is a cachexia, however, which resembles greatly that of any chronic, organic trouble, but is not diagnostic, although it has in it certain appearances and conditions which often render the animal suspicious to the eye of the expert veterinarian, while without the presence of local lesions he would be unable to state on what he has based his opinion.

ACUTE GLANDERS.

Symptoms.—In the acute form of glanders is found the symptoms which have just been studied in chronic farcy and in chronic glanders in a more acute and aggravated form. There is a rapid outbreak of nodules in the respiratory tract which rapidly degenerate into chancres and pour out a considerable discharge from the nostrils. There is a cough of more or less severity according to the amount and site of the local eruption. Over the surface of the body swellings occur which are rapidly followed by farcy buttons, which break into ulcers; we find the indurated cords and enlargement of the lymphatics.

Bleeding from the nose, sudden swelling of one of the hind legs, and the swelling of the testicles are apt to precede an acute eruption of glanders. As the symptoms become more marked the animal has difficulty of respiration, the flanks heave, the respiration becomes rapid, the pulse becomes quickened, and the temperature becomes elevated to 103°, 104°, or 105° F.

With the other symptoms of an acute fever the general appearance and station of the animal is that of one suffering from an acute pneumonia, but upon examination, while sibilant and mucous rales over the side of the chest may be found and one may possibly hear tubular murmurs at the base of the neck over the trachea, there is not found the tubular murmur or the large area of dullness on percussion over the sides of the chest which belongs to simple pneumonia.

Cases of chronic farcy and glanders, if not destroyed, may live in a depraved condition until the animal dies from general emaciation and anemia, but in the majority of cases, from some sudden exposure to cold, it develops an acute pneumonia or other simple inflammatory trouble which starts up the latent disease and the animal has acute glanders.

In the ass, mule, and plethoric horses acute glanders usually terminates by lobular pneumonia. In other cases the general symptoms may subside. The symptoms of pneumonia gradually disappear, the temperature lowers, the pulse becomes slower, the ulcers heal, leaving small indurated cicatrices, and the animal may return to apparent health, or may at least be able to do a small amount of work with but a few symptoms of the disease remaining in a chronic form. During the attack of acute glanders the inflammation of the nasal cavities frequently spreads into the sinuses or air cells, which are found in the forehead and in front of the eyes on either side of the face, and cause abscesses of these cavities, which may remain as the only visible symptom of the disease. An animal which has recovered from a case of acute glanders, like the animals which are affected by chronic glanders and chronic farcy, are apt to be affected with emphysema of the lungs or the heaves, and to have a chronic cough. In this condition they may continue for a long period, serving as dangerous sources of contagion, the more so because the slight amount of discharge does not serve as a warning to the owner or driver as profuse discharge does in the more acute cases.

Treatment.—Almost the entire list of drugs in the pharmacopœia has been tested in the treatment of glanders. Good hygienic surroundings, good food, with alteratives and tonics, frequently ameliorate the symptoms, and often do so to such an extent that the animal would pass the examination of any expert as a perfectly sound animal. But while in this case the number of nodules of the lungs, which are invariably there, may be so few as not to cause sufficient disturbance in the respiration as to attract the attention of the examiner, they exist, and will remain there almost indefinitely, with the constant possibility of a return of acute symptoms.

It is probable that some horses may recover from glanders if the infection is slight, but it will not yet do to depend upon this excepting under the most stringent veterinary supervision. With good care, good food, and good surroundings and little work, an animal affected with glanders may live for months or even years in an apparent state of perfect health, but with the first deprivation of food, with a few days of severe hard work, with exposure to cold or with the attack of a simple fever or inflammatory trouble from other causes, the latent seeds of the disease break out and develop the trouble again in an acute form.

In several celebrated cases horses which have been affected with glanders have been known to work for years and die from other causes without ever having had the return of symptoms; but allowing that these cases may occur, they are so few and far between, and the danger of infection of glanders to other horses and to the stable attendants is so great, that no animal which has once been affected with the disease should be allowed to live unless repeated mallein tests have shown him to have become free from taint of glanders.

In all civilized countries, with the exception of some of the States in the United States, the laws are most stringent regarding the prompt declaration on the part of the owner and attending veterinarian at the first suspicion of a case of glanders, and they allow indemnity for the animal. When this is done, in all cases the animal is destroyed and the articles with which it has been in contact are thoroughly disinfected. When the attendants have attempted to hide the presence of the disease in a community, punishment is meted to the owner, attending veterinarian, or other responsible parties. Several States have passed excellent laws in regard to glanders, but these laws are not always carried out with the rigidity with which they should be.—(Spl. Rpt. Horse Dept. Ag. 1911; B. A. I. Bul. 136; Ark. E. S. 35, 87; Miss. E. S. 16; Mont. E. S. 4; U. Nev. A. E. S. Cir. 1, 1909; S. Dak. E. S. 25; Okla. E. S. 27.)

MYCOTIC LYMPHANGITIS.

This disease has been known as epizootic lymphangitis, otherwise pseudo-farcy, or Japanese farcy; it is a chronic contagious disease, particularly of equines, caused by a specific organism, and characterized by a suppurative inflammation of the subcutaneous lymph vessels and the neighboring lymph glands. Owing to the fact that this affection does not spread as an epizootic and that its casual factor is a yeastlike fungus, the name mycotic instead of epizootic lymphangitis is suggested. This disease was first described by Italian and French veterinarians, and the specific organism was discovered by Rivolta in 1873. The presence of the disease in the United States was first observed in Pennsylvania in 1907, although it is probable that it has existed in various parts of this country for many years. More recently its presence was definitely established in Ohio, Iowa, California, and North Dakota, and there is a probability of its existence in Indiana and several Western States. The disease is also present in the Philippine Islands, Hawaiian Islands, and Porto Rico.

The period of incubation varies greatly, extending from three weeks to four months, or even longer. In artificial inoculations with pus through wounds in the skin, inflammation and swelling of the lymph vessels may be noticed in twenty to sixty days, and these vessels show in their course a development of hard nodules, from which abscesses form. The natural infection is without doubt caused through superficial wounds, such as galls, barbed-wire cuts, or through various stable utensils, harness, bandages, insects, etc.

Symptoms.—The inflammation of the lymph vessels is usually first observed on the extremities, especially on one or both hind legs; it may also appear on the forelegs, shoulder, or neck, and more rarely on the rump, udder, and scrotum. The lesions, as a rule, develop in the tissue adjacent to the place of inoculation. In the early stages of the disease the lymph vessels appear very hard and thickened, and along their course hard nodules develop, ranging in size from a pea to a hen's egg. Later these nodules soften, burst spontaneously, and discharge a thick, yellowish pus. The surface of the resulting ulcers or abscess cavities soon fills up with exuberant granulation which protrudes beyond the surface of the skin, giving a fungoid appearance. The affected extremities are considerably enlarged, similar to cases of simple lymphangitis. In rare cases the mucous membrane of the nostrils may also become affected, showing yellowish flat elevations and ulcerations, and these may extend by metastasis to internal organs. In cases where the mucous membrane is affected, the submaxillary lymph gland may also become enlarged and suppurate. The constitutional symptoms accompanying this disease are not very marked or may be altogether absent. There is usually only a very slight fever, which seldom runs over 102°F. The appetite is not impaired except in the advanced cases.

Lesions.—The anatomical changes are most marked in the skin and the subcutaneous tissues. They may become 2 to 3 inches thick and indurated as the result of fibrous-tissue formation, due to the inflammation present. On the baconlike cut surface suppurative areas and granulating sores may be noticed of various sizes, also enlarged lymph vessels filled with clotted lymph mixed with pus.

Diagnosis.—The diagnosis is based on the characteristic appearance of the ulcerations, which show exuberant granulation of a bright red color, inverted edges, and a thick, creamy, glutinous discharge. These manifestations differentiate the disease from glanders, in which the ulcers are craterlike, do contain exuberant granulations, and the discharge is of a viscous, oily character. The submaxillary and other nodes as well as the corded lymphatics in glanders are more firmly attached to the adjacent tissues, and are therefore less movable. In some chronic cases of mycotic lymphangitis, however, the lesions may closely resemble those of farcy, and in these cases the microscopical examination of the pus will disclose the nature of the affection. In the pus the saccharomyces can be easily seen in the unstained specimen and is recognized by its size, shape, and highly refractory double outline. Furthermore, the injection of mallein in cases of mycotic lymphangitis will be attended with negative results.

Treatment.—Treatment consists at the onset of the disease in entire extirpation of the nodules, lymph vessels, and neighboring lymph glands in case the lesions are localized. In cases where the nodules have formed abscesses, their opening is recommended, followed by the application of the actual cautery or a 1 to 250 solution of bichlorid of mercury. It must be borne in mind that the organism is highly resistant to almost every antiseptic, and the best results will be obtained from the application of a solution of a strong antiseptic following the opening of the lesions. In the most favorable cases, recovery results in from five to seven weeks; as a rule, however, it requires several months.

In order to prevent the spreading of the disease the affected animals should be isolated, the products of the disease should be destroyed, and the stable should be disinfected with very strong liquid disinfectants in consideration of the great resistance of the causative organism.—(Spl. Rpt. Horse Dept. Agr. 1911.)

RABIES, HYDROPHOBIA, OR MADNESS.

Rabies is a contagious disease, which is usually transmitted by a bite and by the introduction of a virus contained in the saliva of an affected animal. It may, however, be transmitted in other ways. It is characterized by symptoms of aberration of the nervous system and invariably terminates fatally. It is accompanied by lesions, inflammation, and degeneration in the central nervous system. It is a disease that is most common in the dog, but is transmitted to the horse, either from dogs or from any other animal affected with it. As a disease of the horse it is invariably the result of the bite of a rabid animal, usually a dog.

Perhaps no disease in medicine has been the object of more controversy than rabies. Certain medical men of prominence have even doubted the existence of the disease. Many medical men have claimed for it a spontaneous origin. The experience, however, of ages has shown that contagion can be proved in the great majority of cases, and, by analogy with other contagious diseases, we may only believe that the development of one case requires the pre-existence of a case from which the virus has been transmitted.

Symptoms.—From the moment of inoculation by the bite of a rabid dog or other rabid animal or by other means, a variable time elapses before the development of any symptoms. This time may be eight days or it may be several months; it is usually about four weeks. The first symptom is an irritation of the original wound. This wound, which may have healed completely, commences to itch until the horse rubs or bites it into a new sore. The horse then becomes irritable and vicious. It is especially susceptible to moving objects; excessive light, noises, the entrance of an attendant, or any other disturbance will cause the patient to be on the defensive. It apparently sees imaginary objects; the slightest noise is exaggerated into threatening violence; the approach of an attendant or another animal, especially a dog, is interpreted as an assault and the horse will strike and bite. The violence on the part of the rabid horse is not for a moment to be confounded with the fury of the same animal suffering from meningitis or any other trouble of the brain. But in rabies there is a volition, a premeditated method, in the attacks which the animal will make, which is not found in the other diseases. Between the attacks of fury the animal may become calm for a variable period. In the period of fury the horse will bite at the reopened original wound; it will rear and attempt to break its halter and fastenings; it will bite at the woodwork and surrounding objects in the stable. If the animal lives long enough it shows paralytic symptoms and falls to the ground, unable to use two or more of its extremities, but in the majority of cases, in its excesses of violence, it does physical injury to itself. It breaks its jaws in biting at the manger or fractures other bones in throwing itself on the ground and dies of hemorrhage or internal injuries. At times throughout the course of the disease there is an excessive sensibility of the skin which, if irritated by the touch, will bring on attacks of violence. The animal may have appetite and desire water throughout the course of the disease, but on attempting to swallow has a spasm of the throat, which renders the act impossible. This latter condition, which is common in all rabid animals, has given the disease the name of hydrophobia (fear of water).

Diagnosis.—The diagnosis of rabies in the horse is to be made from the various brain troubles to which the animal is subject; first by the history of a previous bite of a rabid animal or inoculation by other means; second, by the evident volition and consciousness on the part of the animal in its attacks, offensive and defensive, on persons, animals, or other disturbing surroundings. The irritation and reopening of the original wound or point of inoculation is a valuable factor in diagnosis. Recovery from rabies may be considered as a question of the correctness of the original diagnosis. Rabies is always fatal.

Treatment.—No remedial treatment has ever been successful. All of the anodynes and anesthetics, opium, belladonna, bromide of potash, ether, chloroform, etc., have been used without avail. The prophylactic treatment of successive inoculations is being used on human beings, and has experimentally proved efficacious in dogs, but would be impracticable in the horse unless the conditions were quite exceptional.

Prevention.—When a horse is known to have been bitten by a rabid animal, immediate cauterization of the wound with a red-hot iron may possibly destroy the virus before absorption of it takes place.—(Spl. Rpt. Horse, Dep. Ag., 1911; Colo. E. S. B. 162.)

ANTHRAX.

(SYNONYMS: Charbon, carbuncle, splenic fever, splenic apoplexy.)

Anthrax is a severe and usually fatal contagious disease, characterized by chills, great depression and stupor of the animal, and a profound alteration of the blood. It is caused by the entrance into the animal's body of a bacterium, or its spores. Practically all animals are susceptible to anthrax. The herbivora are especially susceptible, in the following order: The sheep, the ox, and the horse. The guinea pig, the hog, the rabbit, mice and other animals die quickly from its effects. Man, the dog, and other omnivora and carnivora may be attacked by it in a constitutional form as fatal as in the herbivora, but fortunately, in many cases, develop from it only local trouble, followed by recovery.

Causes.—The causes of anthrax were for a long time attributed entirely to climatic influence, soil, and atmospheric temperature, and they are still recognized as predisposing factors in the development of the disease, for it is usually found, especially when outbreaks over any number of animals occur, in low, damp, marshy countries during the warm seasons. It is more frequent in districts where marshy lands dry out during the heat of summer and are then covered with light rains. Decaying vegetable matter seems most favorable for nourishing and preserving the virus. The direct cause of anthrax is always infection of a previously sound animal, either directly from a diseased animal or through various media which contain execretions or the débris from the body of the previously infected animal.

The specific virus of anthrax was first discovered in 1851. It was not, however, till a quarter of a century later that the exact nature of the bacillus, the mode of its propagation, and its exact relationship to anthrax as the sole cause of the disease was defined. In the animal body the bacilli have a tendency to accumulate in the spleen, liver, and elsewhere, so that these organs are much more virulent than the muscles or less vascular tissues. When eliminated from the animal in the excretions, or when exposed to outside influences by the death of the animal and the disintegration of the tissues, the body of the rod is destroyed and the spores only remain. These spores, which may be called the seeds of the bacilli, retain their vitality for a long period; they resist ordinary putrefaction; they are unchanged by moisture; and they are not affected by moderate heat. If scattered with the débris of a dead animal on the surface of the ground, they may remain around the roots of the grass in a pasture or may be washed to the nearest low-lying ground or marsh. If buried in the body of an animal dead from anthrax, they may be washed deep into the ground, and in later years (in one proven case 17 years) be brought to the surface and infect other animals. They are frequently brought to the surface of the earth, having been swallowed by earthworms, in the bodies of which they have been found.

This accounts for the outbreaks at the time of the first rains after a dry season. During the latter the earthworm goes deep in the ground in search of moisture; it finds the spore which has been washed there in past years, swallows it, and afterwards brings it to the surface. The virus is carried with the wool from infected sheep and remains in it through the process of manufacture into cloth. The spores remain in the hides of animals which have died of anthrax and retain their vitality throughout months of soaking in the tanners' pits, the working of the harness maker or the cobbler, and after the oiling of the completed leather. The dried spores in the dust from any of these products may be carried by the atmosphere.

Infection of an animal takes place through inoculation or contact of the bacillus or its spores with an abraded surface or mucous membrane on a sound animal. In an infected district horses may eat the rich pasturage of spring and early summer with impunity, but when grass become low they crop it close to the ground, pull up the roots around which the virus may be lodged, and under these conditions the animals are more apt to have abrasions of the lips or tongue by contact with dried stubble and the dirt on the roots, which favors the introduction of the germs into the system. The virus may be introduced with food and enter the blood-vessel system from the stomach and intestines. If contained in the dust, dried hay, or on the parched pasture of late summer, the virus may be inhaled and be absorbed from the lining of the lungs. If contained in harness leather, it needs but an abrasion of the skin, as the harness rubs it, to transfer the spore from the leather to the circulation of the animal.

Symptoms.—The symptoms of anthrax usually develop with extreme rapidity. The horse is dejected and falls into a state of profound stupor, attended by great muscular weakness. The feeble, indolent animal, if forced to move, drags its legs. There are severe chills, agitation of the muscles, symptoms of vertigo, and at times colicky pains. The mucous membranes turn a deep ocher or bluish red color. The body temperature is rapidly elevated to 104° or 105° F. The breathing is increased to thirty or forty respirations in the minute and the pulse is greatly accelerated, but while the arteries are soft and almost imperceptible, the heart beats can be felt and heard, violent and tumultuous. In some cases, when inoculation is through the skin, large subcutaneous swellings appear; these may involve a leg, a shoulder, one side of the body, or the neck or head. The swelling is at first hot and painful, but afterwards it becomes necrotic and sensation is lost. The symptoms last but two, three, or four days at most, when the case usually terminates fatally.

Treatment.—The treatment of anthrax has little in it to encourage one. The curative treatment, for which almost every drug in the pharmacopœia has been used, is practically without avail. The treatment formerly consisted in the avoidance of certain fields and marshes which were recognized as contaminated during the months of August and September and had been occupied the years in which the outbreaks usually occurred. It underwent, however, a revolution after the discovery of the possibility of a prophylactic inoculation or vaccination which granted immunity from future attacks of the disease similar to that granted by the recovery of an animal from an ordinary attack of the disease.

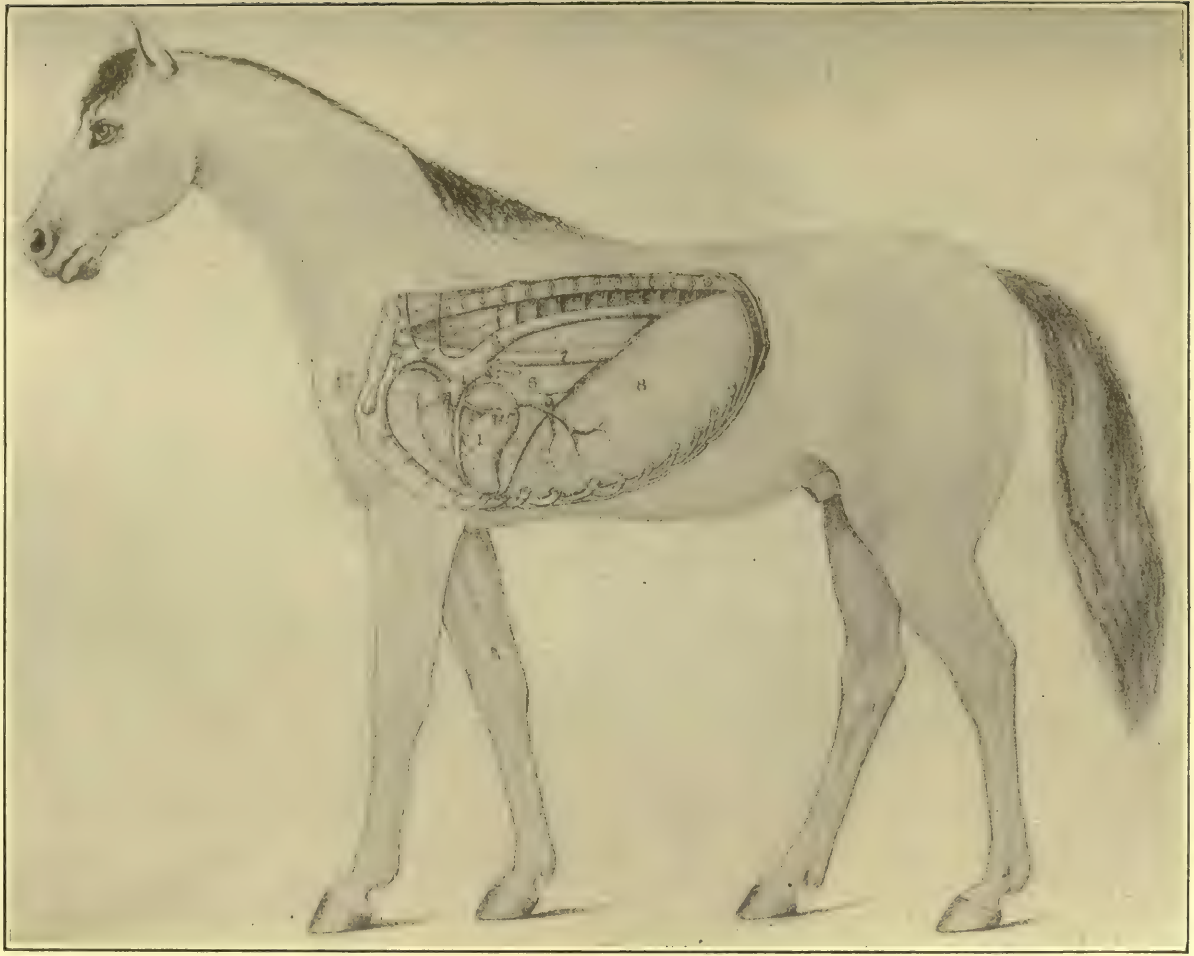
This treatment consists in the use of a vaccine which is made by the artificial cultivation of the virus of anthrax in broth and in the treatment of it by means of continued exposure to a high temperature for a certain length of time, which weakens the virus to such an extent that it is only capable of producing a very mild and not dangerous attack of anthrax in the animal in which it is inoculated, and thus protects the animal from inoculation of a stronger virus. The production of this virus, which is carried on in some countries at the expense of the government and is furnished at a small cost to the farmers in regions where the disease prevails, in this country is made in private laboratories only.—(Spl. Rpt. Horse, Dept. Agr., 1911; F. B. 79; Ark. E. S. 96; Del. Col. E. S. 20, 32, 37, 90; La. E. S. 44; S. Dak. E. S. 36; Okla. E. S. 27.)

INFECTIOUS ANEMIA (SWAMP FEVER).

This disease which in horses is also known by a number of other names, as swamp fever, American surra, malarial fever, typhoid fever of horses, the unknown disease, no-name disease, plains paralysis, and pernicious anemia, has recently been the subject of much investigation. The cause of the disease has now been definitely determined as an invisible virus, which is capable of passing through the pores of the finest porcelain filters, like the infection of foot-and-mouth disease, rinderpest, hog cholera, and similar diseases. The disease is most prevalent in low-lying and badly drained sections of the country, although it has been found in altitudes as high as 7,500 feet on marshy pastures during wet seasons. Therefore proper drainage of infected pastures is indicated as a preventive. It is also more prevalent during wet years than in dry seasons. It usually makes its appearance in June and increases in frequency until October, although the chronic cases may be seen in the winter, having been contracted during the warm season.

Cause.—It has been conclusively proven that infectious anemia is produced by an invisible, filterable organism which is transmissible to horses, mules, and asses by subcutaneous inoculation of blood serum. The virus which is present in the blood may be transmitted to a number of equines in a series of inoculations by injecting either the whole blood, the defibrinated blood, or the blood serum which has been passed through a fine filter, thus eliminating all the visible forms of organismal life, including bacteria, etc. This virus has also been found to be active in the carcass of an affected animal twenty-four hours after death.

Following the injection of the infectious principle there is a period of incubation which may extend from ten days to one and one-half months, at the end of which time the onset of the disease is manifested by a rise of temperature. If uncomplicated, the infection runs a chronic course, terminating in death in from two months to one and one-half years, or even longer. The probability of the virus being spread by an intermediate host, such as flies, mosquitoes, internal parasites, etc., is now receiving careful investigation. From experiments already conducted it appears that this disease, formerly supposed to be confined to Manitoba and Minnesota, is more or less prevalent in Kansas, Nebraska, Colorado, Wyoming, Montana, North Dakota and Texas.



INTERIOR OF CHEST, SHOWING POSITION OF HEART. B. A. I.

Symptoms.—The disease is characterized by a progressive pernicious anemia, remittent fever, and gradual emaciation in spite of a voracious appetite. It begins to manifest itself by a dull, listless appearance and by general weakness, the animal tiring very easily. This stage is followed closely by a staggering, swaying, uncertain gait, the hind legs being mostly affected. There is also noted a weakness and tenderness in the region of the loins, and at the same time the pulse increases in rapidity and may run as high as 70, though weak, stringy, and intermittent. The temperature may rise to 103° F. or higher, remaining high for several days, and then dropping, to rise again at irregular intervals. Toward the end of the disease the temperature occasionally remains persistently high. The horse may improve for a time, but usually this temporary improvement is followed by a more severe attack than the first. Venous regurgitation is sometimes noticed in the jugular before death. The quantity of urine passed is enormous in some cases. Death finally occurs from exhaustion or syncope.

Diagnosis.—The diagnosis of the disease is not difficult, especially in advanced stages. The insidious onset, remittent fever, progressive emaciation and anemia, unimpaired or ravenous appetite, staggering gait, and polyuria are a train of symptoms which make the disease sufficiently characteristic to differentiate it from other diseases affecting horses in this country. The peculiar relapsing type of fever, the great reduction in the number of red blood cells, and the absence of eosinophilia are sufficient to differentiate it from the anemias produced by internal parasites, while it may be readily distinguished from surra by the nonsusceptibility of cattle and by the great ease with which the trypanosoma may be found in the latter affection.

Prognosis.—The prognosis of the disease is very unfavorable. Veterinarians in different sections of the country where it is prevalent report a mortality of 75 per cent or even higher. Recovery takes place only when treatment is begun early or when the animal has a long convalescent period.

Treatment.—The treatment of the disease has so far been far from satisfactory. The iodid, permanganate, and carbonate of potash have been used. Arsenic, axytol, quinin, and silver preparations have been suggested, but all have uniformly been without success. Intestinal antiseptics have been resorted to, and the results are encouraging but not altogether satisfactory. Symptomatic treatment seems to be the most dependable. The mortality from this affection has been reduced by giving an antipyretic of 40 grains of quinin, 2 drams of acetanilid, and 30 grains of powdered nux vomica four times daily.

In the late stages, with weak heart action, alcohol should be substituted for acetanilid. Cold-water sponge baths may be given, and in addition frequent copious injections of cold water per rectum, which has a beneficial effect in reducing the temperature and in stimulating peristalsis of the bowels, which, as a result of the disease, show a tendency to become torpid during the fever. Avoid giving purgatives unless absolutely necessary, on account of their debilitating effect, but instead give laxative, easily digestible feeds. Not infrequently a dirty yellowish tinge of the visible mucous membranes has been observed, in which cases 20 grains of calomel in from 2 to 4 drams of aloes in a ball, or 2-dram doses of fluid extract of podophyllin, may be given. Following the subsidence of the fever, a tonic should be administered, composed of the following drugs in combination:

	Grams.
Arsenious acid	2
Powdered nux vomica	28
Powdered cinchona bark	85
Powdered gentian root	110

These should be well mixed and one-half tablespoonful given at each feed to the affected animal. As in the case of all other infectious diseases, the healthy should be separated from the sick horses, and thorough disinfection of the infected stable, stalls, litter, and stable utensils should be carried out in order to prevent the recurrence of the disease. As a disinfectant, the compound solution of cresol, carbolic acid, or chlorid of lime may be used, by mixing 6 ounces of any one of these chemicals with 1 gallon of water. One of the approved coal-tar sheep dips might also be used to advantage in a 5 per cent solution (6 ounces of dip to 1 gallon of water.) The disinfectant solution should be applied liberally to all parts of the stable, and sufficient lime may be added to the solution to make the disinfected area conspicuous.—(Spl. Rpt. Horse, Dept. Agr., 1911; Nebr. E. S. 22; Nev. E. S. 68; Tex. E. S. 119; Kans. E. S. 136; N. Dak. E. S. 94.)

SCALMA.

The differentiation of the various diseases which have popularly been included under the terms of distemper and influenza up to a comparatively recent date has been so slow and so tardily accepted by the majority of practitioners that we have been subjected to constantly seeing announced and heralded as news in the daily papers the appearance of some new disease. These new diseases of the populace and of the empiric are to us but the epizootic outbreak or the more severely manifested form of some ordinary contagious diseases. There is, however, one of the contagious fevers of the horse which has constantly been confounded with other diseases, and which has not been separated from them in our English textbooks.

Definition.—Scalma is a contagious and infectious febrile disease of the horse, with local lesions of the bronchi, trachea, and larynx, which is evidenced by cough. It is further characterized by great irritability of temper. It occurs as a stable plague; that is, in epizootic form, with, however, great variations in the susceptibility of the animals to contract it. It is rarely fatal except from complication.

Incubation.—The period of incubation is from six to seven days, but the disease may develop in two days after exposure or it may decay its appearance for ten days. It spreads through a stable slowly, developing at times in a horse placed in a stall where the previously sick one had stood, or it may pass next to an animal several stalls away. One attack is usually protective.

Symptoms.—The symptoms are ushered in by fever, in which the acceleration of the pulse and respiration is in no way in accord with the great elevation of temperature. With the appearance of the fever is developed a diffuse bronchitis, which is, however, subacute both in its character and in its course. At times the trouble of the bronchi may extend to the trachea, larynx, pharynx, or even to the nasal fossæ.

In two or three days a trifling grayish albuminous discharge from the nostrils occurs, which continues, variable in quantity, for eight to fourteen days, or may even last three weeks. The cough is short, rough, and painful, spasmodic in its occurrence and in character. The slight watery or slimy discharge may become more profuse, purulent, or even rusty, if the bronchitis has extended to the neighboring structures. The respiration is moderate and affected only during an excess of coughing, or in complicated cases. The pulse undergoes but little quickening. The temperature rises rapidly to 102.2°, 104°, and in some cases even to 107.5° F. The latter temperature usually, but not always, indicates complication by pleurisy. In ordinary cases the temperature drops in two or three days after the appearance of the cough. The skin is dry and rough, with the hairs on end, but the horse appears as an animal out of condition rather than as a sick one. Emaciation may be rapid. The mucous membranes are moderately reddened. The appetite is diminished, but the animal chews constantly. Deglutition, either of food or water, is frequently the cause of spasms of coughing, and these in turn seem to warn the animal against attempts at swallowing. On percussion no alteration of resonance is to be detected. On auscultation of the lungs mucous rales are heard with at times tubular breathing; the latter, however, we will study under the complications, as also the friction warning of pleurisy. Throughout the course of the disease we have still one constant and characteristic symptom—nervous irritability. With temperature of 104° to 107° F., the horse still flinches to the touch on the loins; it stands frequently with the head up, and is on the alert for the entrance of anyone to the stall. The previously good-tempered and quiet horse will turn and bite, will strike with the hind legs, or at the first touch on the side, head, or throat will half rear and back into the corner of the box, or, breaking the halter, turn backward out of the stall.

The course of the disease is from five to eight days, but the cough, may continue for two or three weeks with variable elevation of temperature. As a stable plague the course is from two to three months, as the contagion is much more uncertain than in strangles or influenza. The termination is by resolution and recovery or by complications. In resolution the temperature drops, the cough becomes less frequent and less spasmodic in character, the appetite returns, and no sign is left of the disease except the fever mark on the hoof.

Complications.—The complications are excessive spasms and pleurisy. In the former the cough may be so violent as to convulse the whole animal, the legs are spread and fixed, with the hind ones drawn slightly under the body. The head and neck are extended, with the muscles tense. The cough comes out by rapidly succeeding efforts, or with the first sound the larynx seems to close for a moment before the rest can follow.

Diagnosis.—The diagnosis is based upon the elevation of the temperature without corresponding acceleration of the pulse and of the respirations; upon the retention of appetite and spinal reflex, with the great irritability of temper in the presence of a high temperature, and upon the spasmodic cough and auscultatory sounds of bronchitis with but trifling discharge.

The diagnosis is made from edematous pneumonia by the absence of the yellow colorations, the absence of pneumonia, and the less continuous high temperature; from influenza by the absence of edema, of the ocher coloration, and of the typhoid symptoms; from strangles by want of enlargement of the lymphatics, absence of purulent discharge and abscesses; from variola by the nonappearance of pustules and enlarged lymphatics; from simple bronchitis, as the latter is sporadic, and in it great fever is accompanied by profuse discharge; from rheumatic pleurisy and pleurodynia by the history in these of repeated attacks and great temporary pain; from surgical fever by the absence of cause.

Prognosis.—The prognosis is usually favorable. This disease entails only the loss of ten days' to three weeks' use of the animal, and leaves the subject with no complicating sequelæ. Pleurisy would render the prognosis serious, as the same disease would when occurring from simple causes.

Treatment.—The treatment of a stable should be at once prophylactic. The infected animals should be removed, and complete disinfection of the stalls and area should be made. The individual treatment is simple. The hygienic measures of cleanliness, fresh air without drafts, frequent rubbing, and tempting food should be thorough. The digestive tract is to be regulated by small doses of bicarbonate of soda, sulphate of soda, gentian, and tannic acid. The appetite is to be stimulated by drinks of cold breakfast tea and cow's milk. Antispasmodics are to be used when the cough is excessive. The best of these are camphor, belladonna, stramonium, and steaming with turpentine (turpentine 1 ounce, water half bucket). External frictions of alcohol and turpentine, with hot packs to the loins, will also afford relief. Quinine and salicylic acid may be used during the elevation of temperature. Tracheal injections in 1-ounce doses of the following solution: Acetate of aluminum, 1 per cent; alum, one-half to 1 per cent; bromide of potash, 1 to 2 per cent; water, 100 per cent, are recommended.—(Spl. Rpt. Horse, Dept. Agr., 1911.)

HORSEPOX, OR EQUINE VARIOLA.

This disease is a specific infectious fever of the horse attended by an eruption of pustules, or pocks, over any part of the skin or on the mucous membranes lining the various cavities in the body, but chiefly, and often exclusively, upon the pasterns and fetlocks. The eruption may commence upon the lips, or about the nostrils or eyes.

Variola in the horse, while it is identical in principle, general course, complications, and lesions with variola in other animals, is a disease of the horse itself, and is not transmissible in the form of variola to any other animal; nor is the variola of any other animal transmissible to the horse. Cattle and men, if inoculated from a case of horsepox, develop vaccinia, but vaccinia from the latter animals is not so readily reinoculated into the horse with success. If it does develop, it produces the original disease.

Causes.—The direct cause of horsepox is infection. A large number of predisposing causes favor the development of the disease, as in the case of strangles, and this trouble, like almost all contagious diseases, renders the animal which has had one attack immune. The chief predisposing cause is young age. Old horses which have not been affected are less apt to become infected when exposed than younger ones. The exposure incident to shipment, through public stables, cars, etc., acts as a predisposing cause, as in the other infectious diseases. The period of final dentition is a time of the animal's life which renders it peculiarly susceptible.

Dupaul states that the infection is transmissible through the atmosphere for several hundred yards. The more common means of contagion is by direct contact or by means of fomites. Feed boxes and bridles previously used by horses affected with variola are probably the most frequent carriers of the virus, and we find the lesions in the majority of cases developed in the neighborhood of the lips and nostrils. Coition is a frequent cause. A stallion suffering from this disease may be the cause of a considerable epizootic, as he transmits it to a number of brood mares and they in turn return to the farms where they are surrounded by young animals to whom they convey the contagion. The saddle and croup straps are frequent agents of infection. The presence of a wound greatly favors the inoculation of the disease, which is also sometimes carried by surgical instruments or sponges. Trasbot recites a case in which a set of hobbles, which had been used on an animal suffering from variola, were used on a horse for a quittor operation and transmitted the disease, which developed on the edges of the wound.

Symptoms.—There is a period of incubation, after an animal has been exposed, of from five to eight days, during which there is no appreciable alteration in the health. This period is shorter in summer than in winter. At the end of this time small nodes develop at the point of inoculation and the animal becomes feverish. The horse is dull and dejected, loses its appetite, and has a rough dry coat with the hairs on end. There is moderate thirst. The respirations are somewhat quickened and the pulse becomes rapid and full. The body temperature is elevated, frequently reaching 104° or 105° F. within thirty-six or forty-eight hours from the appearance of the first symptoms.

The visible mucous membranes, especially the conjunctivæ, are of a bright rosy red. In the lymphatic, cold-blooded, and more common horses these symptoms of fever are less marked; even with a comparatively high temperature the animal may retain its appetite and even work comparatively well, but these cases, if worked and overheated, are apt to develop serious complications.

At the end of from three and a half to four days the eruption breaks out, the fever abates, and the general symptoms improve. The eruption in severe cases may be generalized; it may be confined to the softer skin of the nose and lips, the genital organs, and the inside of the thighs, or it may be localized in the neighborhood of a wound or in the irritated skin of a pair of greasy heels. It consists of a varying number of little nodes which, on a mucous membrane, as in the nostrils or vagina, or on soft unpigmented skin, appear red and feel at first like shot under the epidermis. These nodes soften and show a yellowish spot in the center when they become pustules. The epidermis is dissolved and the matter escapes as a viscid fluid, at first citrine and later cloudy and purulent, which dries rapidly, forming scabs; if these fall off or are removed they leave a little shallow concave ulcer which heals in the course of five or six days. In the softer skin if pigmented the cicatrices are white and frequently remain so for about a year, when the pigment returns. The lips or genital organs of a colored horse, if covered with a number of small white spots about the size of a pea, will usually indicate that the animal has been affected with the horsepox.

At times the pustules may become confluent and produce large superficial serpentine ulcers on the membrane of the nostrils, around the lips or eyelids, or on the borders of wounds and in greasy heels; in this case the part becomes swollen, hot, painful, and is covered with a profuse discharge of matter. In this form there is frequently a secondary fever lasting for a day or two. In severe cases there may be a suppurative adenitis, or inflammation of the lymphatic glands which are fed from the affected part. If the eruption is around the nostrils and lips, the glands between the jaws form abscesses as in a case of strangles; if the eruption is in a pair of greasy heels abscesses may form in the fold of the groin. There may be so much tumefaction of the nostrils as to produce difficulty in breathing.

Complications.—A case of horsepox may be attended with various complications of varying degrees of importance. Confluent eruptions irritate the part and induce the animal to rub the inflamed part against the manger or scratch it in other ways, and thus produce troublesome ulcers, which may leave ugly scars. Irritation of the mucous membrane of the nose causes severe coryza with purulent discharge.

The eruption may occur in the throat or in the air tubes to the lungs, developing an acute laryngitis or bronchitis. If the animal is exposed to cold, or worked so as to engorge the lungs with blood at the termination of the specific fever, just when the eruption is about to localize, it may be determined to the lungs. In this case there is a short, dry cough, labored breathing, the development of a secondary fever of some gravity, and all of the external symptoms of a pneumonia. This pneumonia differs, however, from an ordinary pneumonia in the symptoms furnished by the examination of the lungs themselves. In place of a large mass of the lung tissue being affected the inflammation is disseminated in smaller spots over the entire lung.

Diagnosis.—The diagnosis of horsepox is to be based on the presence of a continuous fever, with rosy mucous membranes, for several days, and the appearance of the characteristic eruption. If the eruption is in the nasal cavities, marked by a considerable discharge and attended by submaxillary abscesses, it may be confounded with strangles. If the throat is affected it may be confounded with laryngitis or pharyngitis, but in the latter the local trouble precedes or is concomitant with the fever, while in the former the fever precedes the local trouble by several days. Variola may be confounded with bronchitis or pneumonia if complicated with these troubles and the eruption is absent from the exterior, but it is of little moment, as the treatment for both will be much the same. When the eruption is in the neighborhood of the genital organs this disease has been mistaken for the dourine. In variola the eruption is a temporary one; the nodes and the pustules are followed by shallow ulcers and rapid cicatrization unless continued in the vagina or on the penis by the rubbing of the walls and filth which accumulates; there are apt to be pustules at other parts of the body. In the venereal disease the local trouble commences as a papule and breaks into an ulcer without having formed a pustule. The ulcer has not the convex rosy appearance of that of the less serious discharge; the symptoms last for a longer period, by which time others aid in differentiating the two. In glanders the tubercle is hard, and, after breaking into an ulcer, the indurated bottom remains, grayish or dirty white in color, ragged, and exuding a viscous, oily discharge. There is no disposition to suppuration of the neighboring glands. In variola the rosy shallow ulcer and healthy pus, with the acutely tumefied glands, should not be mistaken, at least after a day.

Prognosis.—The average case of horsepox runs a course of dejection, loss of appetite, and more or less fever for about four days, followed by a rapid convalescence, and leaves the animal as well and as sound as before. If the eruption has been excessive or confluent, the ulceration may act as irritants and render the animal unfit for use for several weeks. Laryngitis, pharyngitis, bronchitis, and pneumonia in this disease are not of greater gravity than they are when occurring from other causes. The spots denuded of pigment left by the pustules on the lips and genitals may temporarily depreciate the value of the animal to a slight degree.

Treatment.—As this is a disease unattended by alterations of the blood itself, although a specific fever, active remedies are admissible and indicated. The horse should be placed on a low diet (little or no oats)—bran mashes, a moderate quantity of good, sound hay, a few carrots or apples, which will act as laxatives, and slop feed. Barley flour is more cooling for mashes than bran or oatmeal. Water may be given as the animal desires it, but it should not be cold; if a half bucketful of water is kept in the manger, the horse will take but a few swallows at a time. One-dram doses of nitrate of potash or 1-ounce doses of sweet spirits of niter are useful in the drinking water. If the fever is high, the antipyretics are indicated: Sulphate of quinine in 1-dram doses; iodide of potash in 1-dram doses; infusion of pine tops, of juniper leaves, of the aromatic herbs, or of English breakfast tea are useful in the later stages. If complications of the air passages or lungs are threatened, a large mustard poultice should be applied to the belly and sides of the chest. Oxide of zinc ointment should be used on confluent eruptions, and if the ulceration is excessive it may have to be touched with caustic.

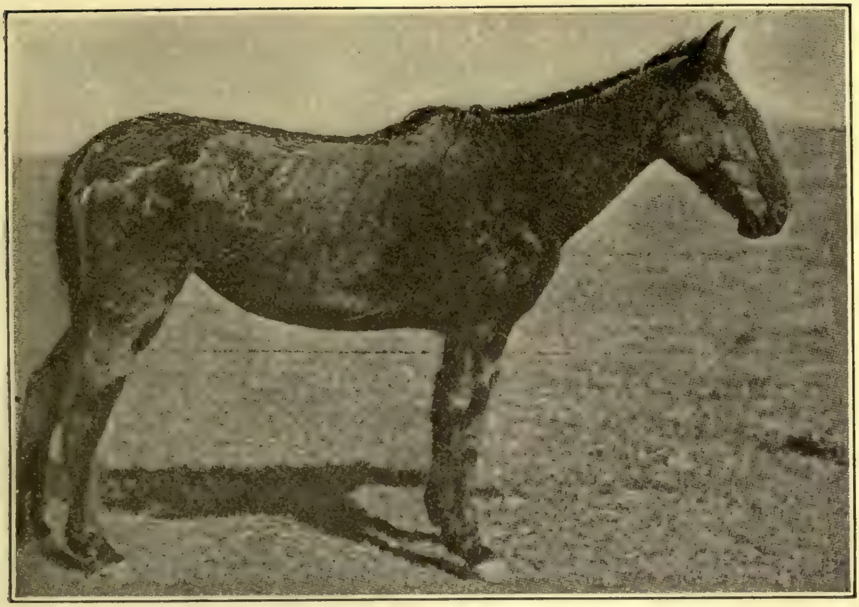
Great care must be taken to keep the animal protected from cold drafts of air or other exposure. Blankets or sheets should be used on the body and bandages on the legs. After convalescence is established, nutritious food of easy digestion and walking exercise are all that is needed, except perhaps a little Glauber's salts to prevent constipation.

Prophylactic Treatment.—When horsepox breaks out among a large number of horses, especially on a farm where there are a number of colts, it may be assumed that the greater majority will contract the disease, and it is more economical that they should have it and be through with it at once. If the weather is moderate, all the animals which have not been affected can be inoculated, which will produce the disease in a mild form, with the eruption at a point of election and render the danger of complication a minimum one. For inoculation the discharge from the pustules of a mild case should be selected and inoculated by scarification on the belly or the under surface of the neck.—(Spl. Rpt. Horse, Dept. Agr., 1911.; Y. B. 1899.)

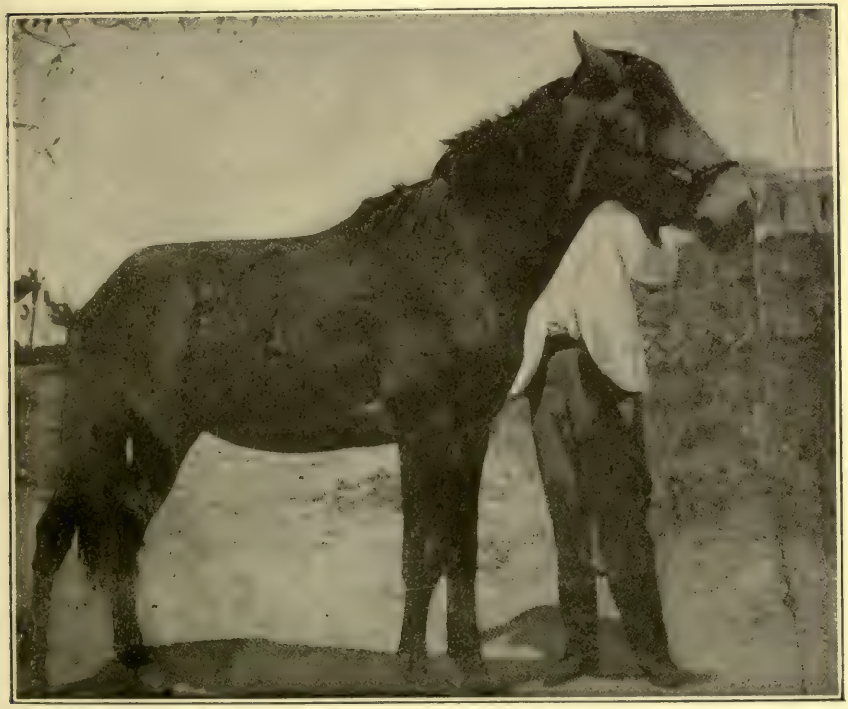
ERYSIPELAS.

This is a specific contagious disease, characterized by spreading dropsical inflammation of the skin and subcutaneous tissues, attended by general fever. It differs from most specific diseases in the absence of a definite period of incubation, a regular course and duration, and a conferring of immunity on the subject after recovery. On the contrary, one attack of erysipelas predisposes to another, partly, doubtless, by the loss of tone and vitality in the affected tissues, but also, perhaps, because of the survival of the infecting germ.

Cause.—It is no longer to be doubted that the microbes found in the inflammatory product are the true cause of erysipelas, as the disease can be successfully transferred from man to animals and from one animal to another by their means. This transition may



Mare Showing Characteristic Lesions of Dermal Mycosis. 24th Annual Report, B. A. I.



Mycotic Lymphangitis in Porto Rican Pony. B. A. I. 25th Rpt.

be direct or through the medium of infected buildings or other articles. Yet from the varying severity of erysipelas in different outbreaks and localities it has been surmised that various different microbes are operative in this disease, and a perfect knowledge of these might perhaps enable us to divide erysipelas into two or more distinct affections. At present we must recognize it as a specific inflammation due to a bacterial poison and closely allied to septicemia. Erysipelas was formerly known as surgical when it spread from a wound (through which the germ had gained access) and medical, or idiopathic, when it started independently of any recognizable lesion. Depending as it does, however, upon a germ distinct from the body, the disease must be looked upon as such, no matter by what channel the germ found an entrance. Erysipelas which follows a wound is usually much more violent than the other form, the difference being doubtless partly due to the lowered vitality of the wounded tissues and to the oxidation and septic changes which are invited on the raw, exposed surface. As apparently idiopathic cases may be due to infection through bites of insects, the small amount of poison inserted may serve to moderate the violence.

This affection may attack a wound on any part of the horse's body, while apart from wounds it is most frequent about the head and the hind limbs. It is to be distinguished from ordinary inflammations by its gradual extension from the point first attacked, by the abundant liquid exudation into the affected part, by the tension of the skin over the affected part, by its soft boggy feeling, allowing it to be deeply indented by the finger, by the abrupt line of limitation between the diseased and healthy skin, the former descending suddenly to the healthy level instead of shading off slowly toward it, by the tendency of the inflammation to extend deeply into the subjacent tissues and into the muscles and other structures, by the great tendency to death and sloughing of portions of skin and of the structures beneath, by the formation of pus at various different points throughout the diseased parts without any surrounding sac to protect the surrounding structures from its destructive action, and without the usual disposition of pus to advance harmlessly toward the surface and escape; and, finally, by a low prostrating type of fever, with elevated temperature of the body, coated tongue, excited breathing, and loss of appetite. The pus when escaping through a lancet wound is grayish, brownish, or reddish, with a heavy or fetid odor, and intermixed with shreds of broken-down tissues. The most destructive form, however, is that in which pus is deficient and gangrene and sloughing more speedy and extensive.

Treatment.—This resolves itself into the elimination from the system of the poisonous products of the bacteria by laxatives and diuretics, the sustaining of the failing vitality by tonics and stimulants, above all those of the nature of antiferments, and the local application of astringent and antiseptic agents. Internal treatment may consist in 4 drams tincture of muriate of iron and one-half dram muriate of ammonia or chlorate of potash, given in a pint of water every two hours. To this may be added, liberally, whisky or brandy when the prostration is very marked. Locally a strong solution of iron, alum, or of sulphate of iron and laudanum may be used; or the affected part may be painted with tincture of muriate of iron or with iodized phenol. In mild cases a lotion of 4 drams sugar of lead and 2 ounces laudanum in a quart of water may be applied. It is desirable to avoid the formation of wounds and the consequent septic action, yet when pus has formed and is felt by fluctuation under the finger to be approaching the surface it should be freely opened with a clean, sharp lancet, and the wound thereafter disinfected daily with carbolic acid 1 part to water 10 parts, with a saturated solution of hyposulphite of soda, or with powders of iodoform or salol.—(Spl. Rpt. Horse, Dept. Agr. 1911.)

DOURINE.

This disease has been described under various names, according to the country in which it is found, chief among which may be mentioned el dourine, maladie du coit, covering disease, equine syphilis, genital glanders, breeding paralysis, chancrous epizootic, epizootic paraplegia, and beschalkrankheit. The most commonly employed name for this affection in the United States is the short and distinctive term dourine, which is taken from the Arabic, meaning unclean.

Dourine is a specific infectious disease affecting under natural conditions only the horse and the ass, transmitted from animal to animal by the act of copulation, and due to a single-celled animal parasite or protozoan, the *Trypanosoma equiperdum.* It is characterized by an irregular incubation period, the confinement of the first symptoms to the genital tract, the chronic course which it runs, and by finally producing complete paralysis of the posterior extremities, with a fatal termination in from six months to two years.

Many widely different theories as to the exact cause of this affection have existed and been advocated in the past 50 years. The fact that the disease spread from animal to animal in certain centers of infection, and that large horse-breeding districts and countries which did not import any breeding animals, such as New Zealand, Australia, England, and South America, remained free from the disease, showed it to be of an infectious nature.

As opposed to the theory of coition playing the entire part as a means of transmission of the disease, there are the statements of Hayne and Haxthusen, who have reported the disease in geldings and also in mares which have never had sexual intercourse with the stallion. It may also be transmitted with ease artificially by means of inoculation into horses, dogs, rabbits, rats, and other susceptible animals, with relatively large quantities of blood and membranes of certain organs of animals affected with the disease. However, sexual intercourse is by far the most common means of transmission, and if other means do exist they are so rare that they have little or no practical importance in the adoption of measures for the suppression of the disease.

Symptoms.—From one to ten days after copulation, or in stallions it may be after some weeks, there is irritation, swelling, and a livid redness of the external organs of generation, sometimes followed by the eruption of small blisters one-fifth of an inch across on the penis, the vulva, clitoris, and the vagina, and the consequent rupture of these vesicles and the formation of ulcers or small open sores. Vesicles have not been noticed in this disease in the dry climate of Illinois. In the mare there is frequent contraction of the vulva, urination, and the discharge of a watery and later a thick viscid liquid of a whitish, yellowish, or reddish color, which collects on and soils the tail. The swelling of the vulva increases and decreases alternately, affecting one part more than another and giving a distorted appearance to the opening. The affection of the skin leads to the appearance of circular white spots, which may remain distinct or coalesce into extensive patches which persist for months. This, with the soiled tail, red, swollen, puckered, and distorted vulva, and an increasing weakness and paralysis of the hind limbs, serves to characterize the affection. The mare rarely breeds, but will take the male, and thus propagate the disease. The disease winds up with great emaciation and stupidity and death in four months to two years. In horses which serve few mares there may be only swelling of the sheath for a year, but with frequent copulation the progress is more rapid. The penis may be enlarged, shrunken, or distorted; the testicles are usually pendent and may be enlarged or wasted and flabby; the skin, as in the mare, shows white spots and patches. Later the penis becomes partially paralyzed and hangs out of the sheath; swelling of the adjacent lymphatic glands (in the groin,), and even of distant ones, and of the skin appears, and the hind limbs become weak and unsteady. In some instances the glands under the jaw swell, and a discharge flows from the nose, as in glanders. In other cases the itching of the skin leads to gnawing and extensive sores. Weakness, emaciation, and stupidity increase until death, in fatal cases, yet the sexual desire does not seem to fail. A stallion without sense to eat, except when food was put in his mouth, would still neigh and seek to follow mares. In mild cases an apparent recovery may ensue, and through such animals the disease is propagated to new localities to be roused into activity and extension under the stimulus of service. The diseased nerve centers are the seat of cryptogamic growths.

Course of the Disease.—This is extremely variable, and may cover a period ranging from nine months to two years. At the commencement of the attack the genital symptoms alone are observable. These, however, sooner or later become complicated by the appearance of the systemic or nervous disturbances, including loss of flesh, staggering gait, and paralysis of the posterior extremities. These symptoms gradually become intensified until the animal, reduced to skin and bone, is unable to rise, and death at last results from exhaustion, lack of nutrition, or from septic infection. This course is markedly influenced by the condition and environment to which the animal has been subjected. Bad weather, exposure, insufficient food, and complicating diseases like influenza, distemper, or in fact any condition which tends to lower the vitality of the animal, will hasten the termination of the disease. On the other hand, good care and abundant food will prolong life, and in this country has even resulted in recovery. It is also possible under favorable conditions that an animal may have dourine in the latent form for several years without manifesting any alarming symptoms and yet be a source of danger.

Prognosis.—Although now and then a case of dourine may recover, as a rule the disease is present merely in a latent state, and the excitement caused by copulation is very likely to cause it to reappear with renewed vigor. The outlook, therefore, from a prognostic point is always to be considered unfavorable, and in a country where a relatively small number of cases appear temporizing methods of suppressing the disease are not warranted.

Diagnosis.—In countries where dourine is the only infection caused by trypanosomes, the diagnosis is made certain by the demonstration of these parasites; but this is connected with considerable difficulty, as the parasites in the blood appear very seldom and then only in small numbers. They are most constant in the serous fluid of the cutaneous plaques and in the edematous swellings and mucopurulent discharges of the vagina, but even here they appear only periodically. While it is a comparatively easy task to diagnose the disease in its acute form if ulcers are present on the genitals and edematous patches on the skin, those cases which have apparently recovered, or which may more properly be termed chronic, present many difficulties. The diagnosis is much easier if several animals are affected at the same time.

Treatment.—Little benefit can be obtained from the medicinal treatment of this chronic malady, nor is such treatment desirable in this country, where the disease has existed only in restricted areas and where sanitary considerations demand its prompt extirpation. Some cases, however, have been observed where improvement and recovery followed local treatment when applied in the early stages of the infection. When, however, any systematic symptoms appear, drugs seem to be useless and deaths follow after very varying periods of time in different cases.

As the infection takes place through the genital apparatus, the thorough application to these parts of antiseptic solutions with the idea of destroying the trypanosomes before they obtain access to the general circulation may be looked upon as the most rational treatment. This, although practicable in the male, is extremely difficult to accomplish thoroughly in the female. Toward this end corrosive sublimate, 1 to 2,000, or 2 per cent solution of carbolic acid or creolin, should be injected into the vagina of the mare and the sheath and penis of the stallion immediately upon the first appearance of inflammation of the genitals following the act of coition in infected localities, or where for any reason the presence of the disease is to be suspected.

After the systemic symptoms of urticarial eruption and paresis with rapid loss of flesh in spite of a good appetite begin to appear, the symptomatic treatment with stimulants and alteratives has been recommended, but is of very slight value except to prolong the life of the patient. Among such drugs may be mentioned strychnin (1 grain three times daily) or potassium iodid (2 to 5 drams daily) for their alterative action.

During the course of treatment care should be taken not to excite the sexual ardor of the patient, as this under all circumstances augments the symptoms, and indeed the act of copulation, in the mare especially, may revive the symptoms of the disease in the acute stage when to all external appearances the animal had recovered from a previous infection.

Method of Eradication.—Sanitary measures looking to the eradication of dourine must depend on the principle that horses infected with dourine should be excluded from breeding. This action is well founded, for, in spite of the possibility of cure, there are as a matter of fact frequent relapses, and further, trypanosomes may exist for months in the sexual organs of the apparently cured animal. Therefore, it is very essential to destroy the diseased mares and to castrate the affected stallions. The objection to spaying mares is that if they should be sold and attempt to breed, the disease may be contracted by the serving stallion and thus spread. On the other hand, stallions which are castrated before the appearance of paralytic symptoms become sound and well, but the stallions even after castration will frequently serve mares. They should therefore be prevented from mingling with mares for a month after the ulcers are healed.—(B. A. I. Bul. 142; Spl. Rpt. Horse, Dept. Agr. 1911.)

CONGESTION.

Congestion is an unnatural accumulation of blood in a part. Excessive accumulation of blood may be normal, as in blushing or in the red face which temporarily follows a violent muscular effort, or, as in the stomach or liver during digestion, or in the lungs after severe work, from which, in the latter case, it is shortly relieved by a little rapid breathing. The term congestion, however, usually indicates a morbid condition, with more or less lasting effects. Congestion is *active* or *passive*. The former is produced by an increased supply of blood to the part, the latter by an obstacle preventing the escape of blood from the tissue. In either case there is an increased supply of blood, and as a result increased combustion and augmented nutrition.

Active Congestion.—This is caused by (1) Functional activity. —Any organ which is constantly or excessively used is habituated to hold an unusual quantity of blood; the vessels become dilated; and if overstrained the walls become weakened, lose their elasticity, and any sudden additional amount of blood engorges the tissues so that they can not contract, and congestion results. Examples: The lungs of a race horse, after an unusual burst of speed or severe work, in damp weather. (2) Irritants.—Heat and cold, chemical or mechanical. Any of these, by threatening the vitality of a tissue, induce immediately an augmented flow of blood to the part to furnish the means of repair—a hot iron, frostbites, acids, or a blow. (3) Nerve influence.—This may produce congestion either by acting on the part reflexly or as the result of some central nerve disturbance affecting the branch which supplies a given organ. (4) Plethora and sanguinary temperament.—Full-blooded animals are much more predisposed to congestive diseases than those of a lymphatic character or those in an anemic condition. The circulation in them is forced to all parts with much greater force and in larger quantities. A well-bred full-blooded horse is much more subject to congestive diseases than a common, coarse, or old worn-out animal. (5) Fevers.—In fever the heart works more actively and forces the current of blood more rapidly; the tissues are weakened, and it requires but a slight local cause at any part to congest the structures already overloaded with blood. Again, in certain fevers, we find alteration of the blood itself, rendering it less or more fluid, which interferes with its free passage through the vessels and induces a local predisposition to congestion. (6) Warm climate and summer heat. —Warmth of the atmosphere relaxes the tissues; it demands of the animals less blood to keep up their own body temperature, and the extra quantity accumulates in the blood-vessel system. It causes sluggishness in the performance of the organic functions, and in this way it induces congestion, especially of the internal organs. So we find founders, congestive colics and staggers more frequent in summer than in winter. (7) Previous congestion.—Whether the previous congestion of any organ has been a continuous normal one —that is, a repeated functional activity—or has been a morbid temporary overloading, it always leaves the walls of the vessels weakened and more predisposed to recurrent attacks from accidental causes than are perfectly healthy tissues. Thus a horse which has had a congestion of the lungs from a severe drive is apt to have another attack from even a lesser cause.

The alterations of congestion are distention of the blood vessels, accumulation of the cellular elements of the blood in them, and effusion of a portion of the liquid of the blood into the fibrous tissues which surround the vessels. Where the changes produced by congestion are visible, as in the eye, the nostril, the mouth, the genital organs, and on the surface of the body in white or unpigmented animals, the part appears red from the increase of blood; it becomes swollen from the effusion of liquid into the spongelike connective tissues; it is at times more or less hot from the increased combustion; the part is frequently painful to the animal from pressure of the effusion on the nerves, and the function of the tissue is interfered with. The secretion or excretion of glands may be augmented or diminished. Muscles may be affected with spasms or may be unable to contract. The eyes and ears may be affected with imaginary sights and sounds.

Passive Congestion.—This is caused by interference with the return current of blood from a part. Old age and debility weaken the tissues and the force of the circulation, especially in the veins, and retard the movement of the blood. We then see horses of this class with stocked legs, swelling of the sheath of the penis or of the milk glands, and of the under surface of the belly. Tumors or other mechanical obstructions, by pressing on the veins, retard the flow of blood and cause it to back up in distal parts of the body, causing passive congestion.

The alterations of passive congestion, as in active congestion, consists of an increased quantity of blood in the vessels and an exudation of its fluid into the tissues surrounding them, but in passive congestion we have a dark thick blood which has lost its oxygen, instead of the rich combustible blood rich in oxygen which is found in active congestion.

The termination of congestion is by resolution or inflammation. In the first case, the choked-up blood vessels find an outlet for the excessive amount of blood and are relieved; the transuded serum or fluid of the blood is reabsorbed, and the part returns almost to its normal condition, with, however, a tendency to weakness predisposing to future trouble of the same kind. In the other case further alterations take place, and we have inflammation.—(Spl. Rpt. Horse Dept. Agr. 1911.)

INFLAMMATION.

Inflammation is a hypernutrition of a tissue. It is described as "a double-edged sword, cutting either way for good or for evil." The increased nutrition may be moderate and cause a growth of new tissue, a simple increase of quantity at first; or it may produce a new growth differing in quality; or it may be so great that, like luxuriant, overgrown weeds, the elements die from their very haste of growth, and we have immediate destruction of the part. According to the rapidity and intensity of the process of structural changes which takes place in an inflamed tissue, inflammation is described as acute or chronic, with a vast number of intermediate forms. When the phenomena are marked it is termed sthenic; when less distinct, as the result of a broken-down and feeble constitution in the animal, it is called asthenic. Certain inflammations are specific, as in strangles, the horsepox, glanders, etc., where a characteristic or specific cause or condition is added to the origin, character of phenomena, or alterations which result from an ordinary inflammation. An inflammation may be circumscribed or limited, as in the abscess on the neck caused by the pressure of a collar, in pneumonia, in glanders, in the small tumors of a splint or a jack; or it may be diffuse, as in severe fistulas of the withers, or an extensive lung fever, in the legs in a case of grease, or in the spavins which affect horses with poorly nourished bones. The causes of inflammation are practically the same as those of congestion, which is the initial step of all inflammation.

The temperament of a horse predisposes the animal to inflammation of certain organs. A full-blooded animal, whose veins show on the surface of the body, and which has a strong, bounding heart pumping large quantities of blood into the vascular organs like the lungs, intestines, and the laminæ of the feet, is more apt to have pneumonia, congestive colics, and founder, than lymphatic, cold-blooded animals which have pleurisies, inflammation of the bones, spavins, ringbones, inflammation of the glands of the less vascular skin of the extremities, greasy heels, thrush, etc. Young horses have inflammation of the membranes lining the air passages and digestive tract, while older animals are more subject to troubles in the closed serous sacs and in the bones.

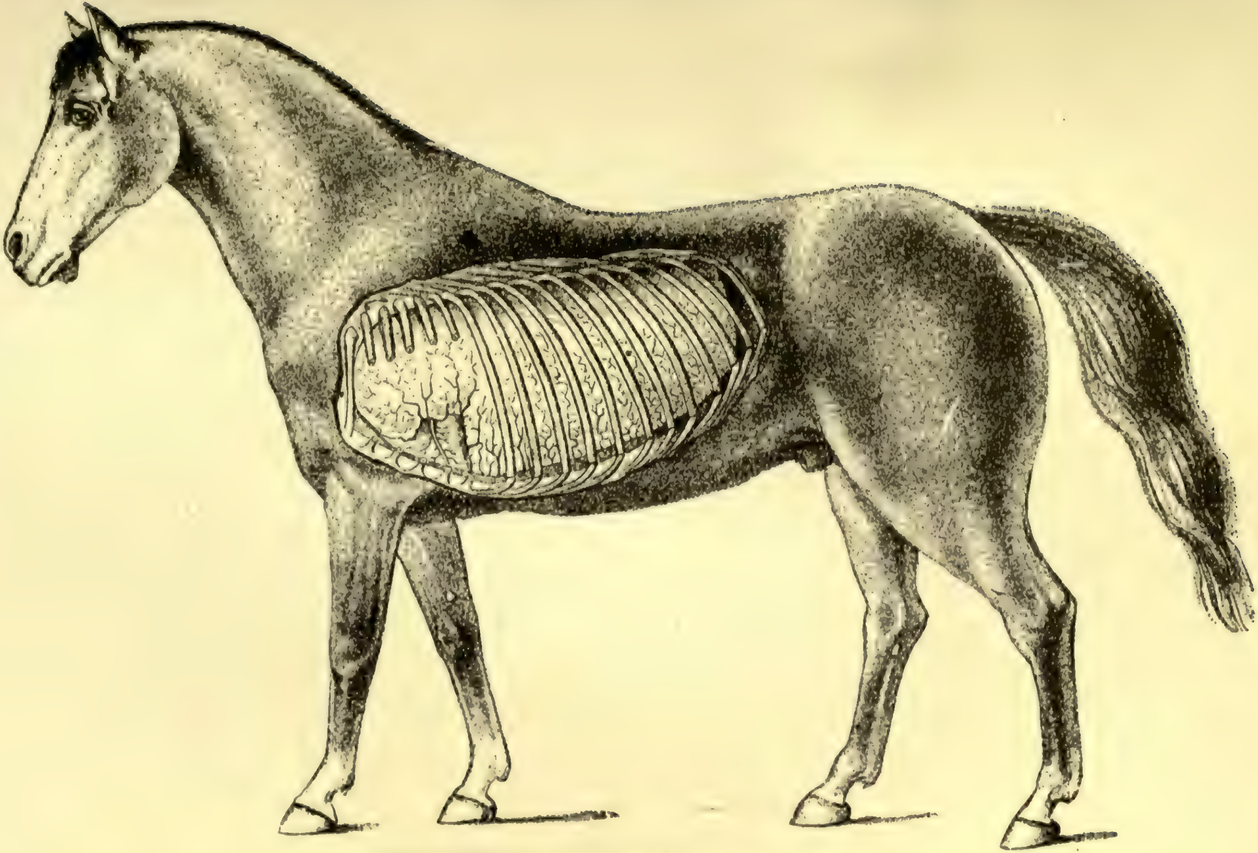
The work to which a horse is put (saddle or harness, speed or draft) will influence the predisposition of an animal to inflammatory diseases. As in congestion, the functional activity of a part is an important factor in localizing this form of disease. Given a group of horses exposed to the same draft of cold air or other exciting cause of inflammation, the one which has just been eating will be attacked with an inflammation of the bowels; the one that has just been working so as to increase its respiration will have an inflammation of the throat, bronchi, or lungs; the one that has just been using its feet excessively will have a founder or inflammation of the laminæ of the feet.

The direct cause of inflammation is usually an irritant of some form. This may be a pathogenic organism—a disease germ—or it may be mechanical or chemical, external or internal. Cuts, bruises, injuries of any kind, parasites, acids, blisters, heat, cold, secretions, such as an excess of tears over the cheek or urine on the legs, all cause inflammation by direct injury to the part. Strains or wrenches of joints, ligaments, and tendons cause trouble by laceration of the tissue.

Inflammations of the internal organs are caused by irritants as above, and by sudden cooling of the surface of the animal, which drives the blood to that organ which at the moment is most actively supplied with blood. This is called repercussion. A horse which has been worked at speed and is breathing rapidly is liable to have pneumonia if suddenly chilled, while an animal which has just been fed is more apt to have a congestive colic if exposed to the same influence, the blood in this case being driven from the exterior to the intestines, while in the former it was driven to the lungs.

Symptoms.—The symptoms of inflammation are, as in congestion, change of color, due to an increased supply of blood; swelling, from the same cause, with the addition of an effusion into the surrounding tissues; heat, owing to the increased combustion in the part; pain, due to pressure on the nerves, and altered function. This latter may be augmented or diminished, or first one and then the other. In addition to the local symptoms, inflammation always produces more or less constitutional disturbance or fever. A splint or small spavin will cause so little fever that it is not appreciable, while a severe spavin, an inflamed joint, or a pneumonia may give rise to a marked fever.

Termination of Inflammation.—Like congestion, inflammation may terminate by resolution. In this case the exuded lymph undergoes chemical change, and the products are absorbed and carried off by the blood vessels and lymphatics, to be thrown out of the body by the kidneys, liver, the glands of the skin, and the other excretory organs. The cells, which have wandered into the neighboring tissues from the blood vessels, gradually disappear or become trans-



POSITION OF THE LEFT LUNG

formed into fixed cells. Those which are the result of the tissue cells, wakened into active life, follow the same course. The vessels themselves contract, and, having resumed their normal caliber, the part apparently reassumes its normal condition; but it is always weakened, and a new inflammation is more liable to reappear in a previously inflamed part than in a sound one. The alternate termination is necrosis, or mortification. If the necrosis, or death of a part, is gradual, by small stages, each cell losing its vitality after the other in more or less rapid succession, it takes the name of ulceration. If it occurs in a considerable part at once, it is called gangrene. If this death of the tissues occurs deep in the organism, and the destroyed elements and proliferated and dead cells are inclosed in a cavity, the result of the process is called an abscess. When it occurs on a surface, it is an ulcer and an abscess by breaking on the exterior becomes then also an ulcer. Proliferating and dying cells and the fluid which exudes from an ulcerating surface and the debris of broken-down tissue is known as pus, and the process by which this is formed is known as suppuration. A mass of dead tissue in a soft part is termed a slough, while the same in bone is called a sequestrum. Such changes are especially likely to occur when the part becomes infected with micro-organisms that have the property of destroying tissue and thus causing the production of pus. These are known as pyogenic micro-organisms. There are also bacilli that are capable of multiplying in tissues and so irritating them as to cause them to die without forming pus.

Treatment of Inflammation.—The study of the causes and pathological alterations of inflammation has shown the process to be one of hypernutrition, attended by excessive blood supply, so this study will indicate the primary factor to be employed in the treatment of it. Any agent which will reduce the blood supply and prevent the excessive nutrition of the elements of the part will serve as a remedy. The means employed may be used locally to the part, or they may be constitutional remedies, which act indirectly.

Local treatment consists of (1) Removal of the cause, as a stone in the frog, causing a traumatic thrush; a badly fitting harness or saddle, causing ulcers of the skin; decomposing manure and urine in a stable, which, by their vapors, irritate the air tubes and lungs and cause a cough. These causes, if removed will frequently allow the part to heal at once. (2) Rest. Motion stimulates the action of the blood, and thus feeds an inflamed tissue. This is alike applicable to a diseased point irritated by movement, to an inflamed pair of lungs surcharged with blood by the use demanded of them in a working animal, or to an inflamed eye exposed to light, or an inflamed stomach and intestines still further fatigued by food. Absolute quiet, a dark stable, and small quantities of easily digested food will often cure serious inflammatory troubles without further treatment. (3) Cold. The application of ice bags or cold water by bandages, douching with a hose, or irrigation with dripping water, contracts the blood vessels, acts as a sedative on the nerves, and lessens the vitality of a part; it consequently prevents the tissue change which inflammation produces. (4) Heat. Either dry or moist heat acts as a derivative. It quickens the circulation and renders the chemical changes more active in the surrounding parts; it softens the tissues and attracts the current of blood from the inflamed organ; it also promotes the absorption of the effusion and hastens the elimination of the waste products in the part. Heat may be applied by hand rubbing or active friction and the application of warm coverings or by cloths wrung out of warm water; or steaming with warm moist vapor, medicated or not, will answer the same purpose. The latter is especially applicable to inflammatory troubles in the air passages. (5) Local bleeding. This treatment frequently affords immediate relief by carrying off the excessive blood and draining the effusion which has already occurred. It affords direct mechanical relief, and, by a stimulation of the part, promotes the chemical changes necessary for bringing the diseased tissues to a healthy condition. Local blood-letting can be done by scarifying, or making small punctures into the inflamed part, as in the eyelid of an inflamed eye, or into the sheath of the penis, or into the skin of the latter organ when congested, or the leg when actually swelled. (6) Counterirritants. These are used for deep inflammations. They act by bringing the blood to the surface and consequently lessening the blood pressure within. The derivation of the blood to the exterior diminishes the amount in the internal organs and is often very rapid in its action in relieving a congested lung or liver. The most common counterirritant is mustard flour. It is applied as a soft paste mixed with warm water to the under surface of the belly and to the sides where the skin is comparatively soft and vascular. Colds in the throat or inflammations at any point demand the treatment applied in the same manner to the belly and sides and not to the throat or on the legs, as so often used. Blisters, iodine, and many other irritants are used in a similar way.

Constitutional Treatment.—This treatment in inflammation is designed to reduce the current of blood, which is the fuel for the inflammation in the diseased part, to quiet the patient, and to combat the fever or general effects of the trouble in the system, and to favor the neutralization or elimination of the products of the inflammation. It consists of (1) Reduction of blood. This is obtained in various ways. The diminution of the quantity of the blood lessens the amount of pressure on the vessels, and, as a sequel, the volume of it which is carried to the point of inflammation; it diminishes the body temperature or fever; it numbs the nervous system, which plays an important part as a conductor of irritation in diseases. (2) Blood-letting. This is the most rapid means, and frequently acts like a charm in relieving a commencing inflammatory trouble. One must remember, however, that the strength of the body and repair depend on the blood. Hence blood-letting should be practiced only in full-blooded, well-nourished animals and in the early stages of the disease. (3) Cathartics. These act by drawing off a large quantity of fluid from the blood through the intestines, and have the advantage over the last remedy of removing only the watery and not the formed elements from the circulation. The blood cells remain, leaving the blood as rich as it was before. Again, the glands of the intestines are stimulated to excrete much waste matter and other deleterious material which may be acting as a poison in the blood. (4) Diuretics. These operate through the kidneys in the same way. (5) Diaphoretics. They aid depletion of the blood by pouring water in the form of sweat from the surface of the skin and stimulating the discharge of waste material out of its glands, which has the same effect on the blood pressure. (6) Antipyretics. They are remedies to reduce the temperature. This may be accomplished by depressing the center in the brain that controls heat production. Some coal-tar products are very effective in this way, but they have the disadvantage of depressing the heart, which should always be kept as strong as possible. If they are used it must be with knowledge of this fact, and it is well to give heart tonics or stimulants with them. The temperature of the body may be lowered by cold packs or by showering with cold water. This is a most useful procedure in many diseases. (7) Depressants. They are drugs which act on the heart. They slow or weaken the action of this organ and reduce the quantity and force of the current of blood which is carried to the point of local disease; they lessen the vitality of the animal, and for this reason are now used much less than formerly. (8) Anodynes. These quiet the nervous system. Pain in the horse, as in the man, is one of the important factors in the production of fever, and the dulling of the former often prevents, or at least reduces, the latter. Anodynes produce sleep, so as to rest the patient and allow recuperation for the succeeding struggle of the vitality of the animal against the exhausting drain of the disease.

The diet of an animal suffering from acute inflammation is a factor of the greatest importance. An overloaded circulation can be starved to a reduced quantity and to a less rich quality of blood by reducing the quantity of food given to the patient. Foods of easy digestion do not tire the already fatigued organs of an animal with a torpid digestive system. Nourishment will be taken by a suffering brute in the form of slops and cooling drinks where it would be totally refused if offered in its ordinary form, as hard oats or dry hay, requiring the labor of grinding between the teeth and swallowing by the weakened muscles of the jaws and throat.

Tonics and stimulants are remedies which are used to meet special indications, as in the case of a feeble heart, and which enter into the after treatment of inflammatory troubles as well as into the acute stages of them. They brace up weakened and torpid glands; they stimulate the secretion of the necessary fluids of the body, and hasten the excretion of the waste material produced by the inflammatory process; they regulate the action of a weakened heart; they promote healthy vitality of diseased parts, and aid the chemical changes needed for returning the altered tissues to their normal condition. —(Spl. Rpt. Horse, Dept. Agr. 1911.)

FEVERS.

Fever is a general condition of the animal body in which there is an elevation of the animal body temperature, which may be only a degree or two or may be 10° F. The elevation of the body temperature, which represents tissue change or combustion, is accompanied by an acceleration of the heart's action, a quickening of the respiration, and an aberration in the functional activity of the various organs of the body. These organs may be stimulated to the performance of excessive work, or they may be incapacitated from carrying out their allotted tasks, or, in the course of a fever, the two conditions may both exist, the one succeeding the other. Fever as a disease is usually preceded by chills as an essential symptom.

Fevers are divided into essential fevers and symptomatic fevers. In symptomatic fever some local disease, usually of an inflammatory character, develops first, and the constitutional febrile phenomena are the result of the primary point of combustion irritating the whole body, either through the nervous system or directly by means of the waste material which is carried into the circulation and through the blood vessels, and is distributed to distal parts. Essential fevers are those in which there is from the outset a general disturbance of the whole economy. This may consist of an elementary alteration in the blood or a general change in the constitution of the tissues. Fevers of the latter class are usually due to some infecting agent and belong, therefore, to the class of infectious diseases.

Essential fevers are subdivided into ephemeral fevers, which last but a short time and terminate by critical phenomena; intermittent fevers, in which there are alterations of exacerbations of the febrile symptoms and remissions, in which the body returns to its normal condition or sometimes to a depressed condition, in which the functions of life are but badly performed; and continued fevers, which include contagious diseases, such as glanders, influenza, etc., the septic diseases, such as pyemia, septicemia, etc., and the eruptive fevers, such as variola, etc.

Whether the cause of the fever has been an injury to the tissues, such as a severe bruise, a broken bone, an inflamed lung, or excessive work, which has surcharged the blood with the waste products of the combustion of the tissues, which were destroyed to produce force, or the toxins of influenza in the blood, or the presence of irritating material, either in the form of living organisms or of their products, as in glanders or tuberculosis—the general train of symptoms are much the same, varying as the amount of the irritant differs in quantity, or when some special quality in them has a specific action on one or another tissue.

There is in fever at first a relaxation of the small blood vessels, which may have been preceded by a contraction of the same if there was a chill, and as a consequence there is an acceleration of the current of the blood. There is, then, an elevation of the peripheral temperature, followed by a lowering of tension in the arteries and an acceleration in the movement of the heart. These conditions may be produced by a primary irritation of the nerve centers of the brain from the effects of heat, as is seen in thermic fever, or sunstroke, or by the entrance into the blood stream of disease-producing organisms or their chemical products, as in anthrax, rinderpest, influenza, etc.

There are times when it is difficult to distinguish between the existence of fever as a disease and a temporary feverish condition which is the result of excessive work. Like the condition of congestion of the lungs, which is normal up to a certain degree in the lungs of a race horse after a severe race, and morbid when it produces more than temporary phenomena or when it causes distinct lesions, the temperature may rise from physiological causes as much as four degrees, so fever, or, as it is better termed, a feverish condition, may follow any work or other employment of energy in which excessive tissue change has taken place; but if the consequences are ephemeral, and no recognizable lesion is apparent, it is not considered morbid. This condition, however, may predispose to severe organic disturbance and local inflammations which will cause disease, as an animal in this condition is liable to take cold and develop lung fever or a severe enteritis, if chilled or otherwise exposed.

Fever in all animals is characterized by the same general phenomena, but we find the intensity of the symptoms modified by the species of animals affected, by the races which subdivide the species, by the families which form groups of the races, and by certain conditions in individuals themselves. For example, a pricked foot in a Thoroughbred may cause intense fever, while the same injury in the foot of a Clydesdale may scarcely cause a visible general symptom. In the horse, fever produces the following symptoms: The normal body temperature, which varies from 99° to 100° F., is elevated from 1° to 9°. A temperature of 102° or 103° F. is moderate fever, 104° to 105° F. is high, and 106° F. and over is excessive. The temperature is accurately measured by means of a clinical thermometer inserted in the rectum.

This elevation of temperature can readily be felt by the hand placed in the mouth of the animal, or in the rectum, and in the cleft between the hind legs. It is usually applicable at any point over the surface of the body and in the expired air emitted from the nostrils. The ears and canons are often as hot as the rest of the body, but are sometimes cold, which denotes a debility in the circulation and irregular distribution of the blood. The pulse, which in a healthy horse is felt beating about 42 to 48 times in the minute, is increased to 60, 70, 90, or even 100. The respirations are increased from 14 or 16 to 24, 30, 36, or even more. With the commencement of a fever the horse usually has its appetite diminished, or it may have total loss of appetite if the fever is excessive. There is, however, a vast difference among horses in this regard. With the same amount of elevation of temperature one horse may lose its appetite entirely, while others, usually of the more common sort, will eat at hay throughout the course of the fever, and will even continue to eat oats or other grains. Thirst is usually increased, but the animal desires only a small quantity of water at a time, and in most cases of fever a bucket of water should be kept standing before the patient, which may be allowed to drink ad libitum. The skin becomes dry and the hairs stand on end. Sweating is almost unknown in the early stage of fevers, but frequently occurs later in their course, when an outbreak of warm sweat is often a most favorable symptom. The mucous membranes, which are most easily examined in the conjunctivæ of the eyes and inside of the mouth, change color if the fever is an acute one; without alteration of blood the mucous membranes become of a rosy or deep-red color at the outset; if the fever is attended with distinct alteration of the blood, as in influenza, and at the end of two or three days in severe cases of pneumonia or other extensive inflammatory troubles the mucous membranes are tinged with yellow, which may even become a deep ocher in color, the result of the decomposition of the blood corpuscles and the freeing of their coloring matter, which acts as a stain. At the outset of a fever the various glands are checked in their secretions, the salivary glands fail to secrete the saliva, and we find the surface of the tongue and inside of the cheeks dry and covered with a brownish, bad-smelling deposit. The excretion from the liver and intestinal glands is diminished and produces an inactivity of the digestive organs which causes a constipation. If this is not remedied at an early period, the undigested material acts as an irritant, and later we may have it followed by an inflammatory process, producing a severe diarrhea.

The excretion from the kidneys is sometimes at first entirely suppressed. It is always considerably diminished, and what urine is passed is dark in color, undergoes ammoniacal change rapidly, and deposits quantities of salts. At a later period the diminished excretion may be replaced by an excessive excretion, which aids in carrying off waste products and usually indicates an amelioration of the fever. While the ears, canons, and hoofs of a horse suffering from fever are usually found hot, they may frequently alternate from hot to cold, or be much cooler than they normally are. This latter condition usually indicates great weakness on the part of the circulatory system.

It is of the greatest importance, as an aid in diagnosing the gravity of an attack of fever and as an indication in the selection of its mode of treatment, to recognize the exact cause of a febrile condition in the horse. In certain cases, in very nervous animals, in which fever is the result of nerve influence, a simple anodyne, or even only quiet with continued care and nursing, will sometimes be sufficient to diminish it. When fever is the result of local injury, the cure of the cause produces a cessation in the constitutional symptoms. When fever is the result of a pneumonia or other severe parenchymatous inflammation, it usually lasts for a definite time, and subsides with the first improvement of the local trouble, but in these cases we constantly have exacerbations of fever due to secondary inflammatory processes, such as the formation of small abscesses, the development of secondary bronchitis, or the death of a limited amount of tissue.

In cases attended with complications, the diagnosis becomes at times still more difficult, as at the end of a case of influenza which becomes complicated with pneumonia. The high temperature of the simple inflammatory disease may be grafted on that of the specific trouble, and the determination of the cause of the fever, as between the two, is therefore frequently a difficult matter but an important one, as upon it depends the mode of treatment.

Any animal suffering from fever, whatever the cause, is much more susceptible to attacks of local inflammation, which become complications of the original disease, than are animals in sound health. In fever we have the tissues and the walls of the blood vessels weakened, we have an increased current of more or less altered blood, flowing through the vessels and stagnating in the capillaries, which need but an exciting cause to transform the passive congestion of fever into an active congestion and acute inflammation. These conditions become still more distinct when the fever is accompanied by a decided deterioration in the blood itself, as is seen in influenza, septicemia, and at the termination of severe pneumonias.

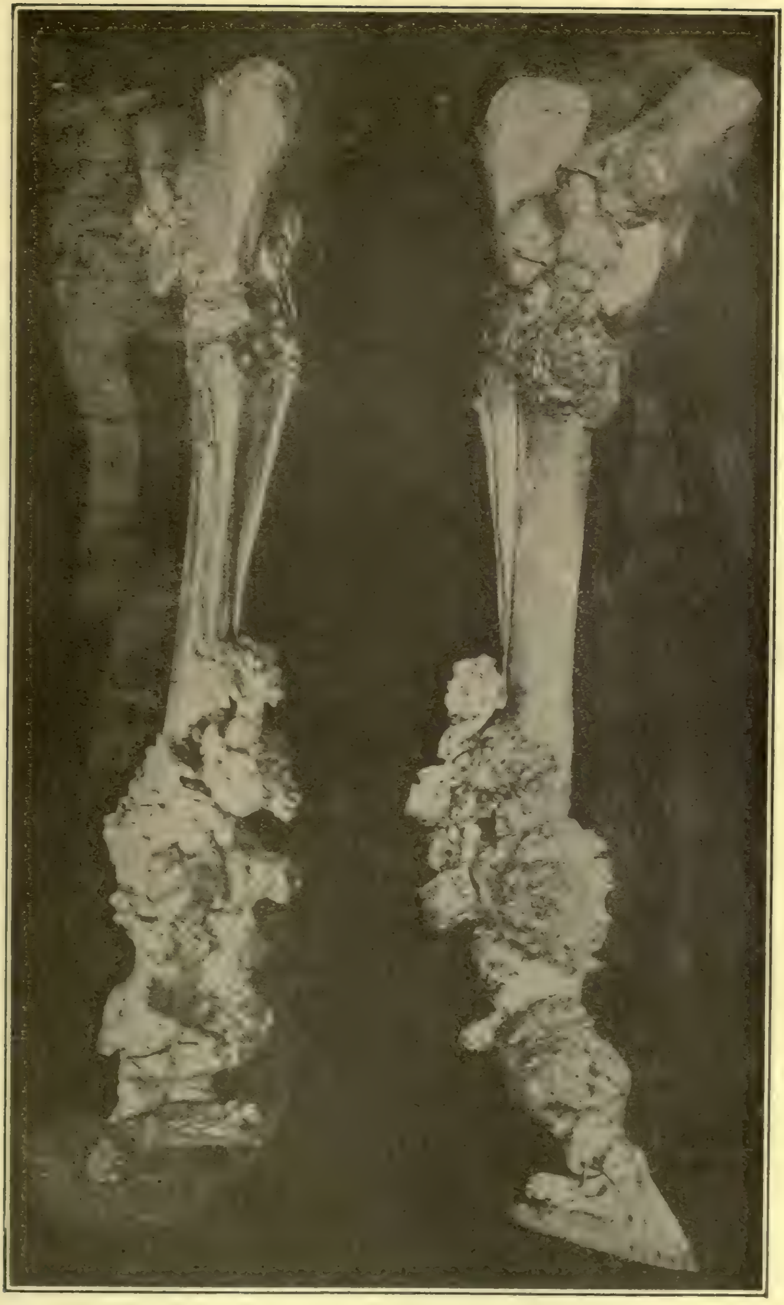
Fever, with its symptoms of increased temperature, acceleration of the pulse, acceleration of respiration, dry skin, diminished secretions, etc., must be considered as an indication of organic disturbance. This organic disturbance may be the result of local inflammation or other irritants acting through the nerves on nerve centers; alterations of the blood, in which a poison is carried to the nerve centers, or direct irritants to the nerve centers themselves, as in cases of heat stroke, injury to the brain, etc.

The treatment of fever depends upon its cause. One of the important factors in treatment is absolute quiet. This may be obtained by placing a sick horse in a box stall, away from other animals and extraneous noises, and sheltered from excessive light and drafts of air. Anodynes, belladonna, hyoscyamus, and opium act as antipyretics simply by quieting the nervous system. As an irritant exists in the blood in most cases of fever, any remedy which will favor the excretion of foreign elements from it will diminish this cause. We therefore employ diaphoretics to stimulate the sweat and excretions from the skin; diuretics to favor the elimination of matter by the kidneys; cholagogues and laxatives to increase the action of the liver and intestines, and to drain from these important organs all the waste material which is aiding to choke up and congest their rich plexuses of blood vessels. The heart becomes stimulated to increased action at the outset of a fever, but this does not indicate increased strength; on the contrary, it indicates the action of an irritant to the heart that will soon weaken it. It is therefore irrational to further depress the heart by the use of such drugs as aconite. It is better to strengthen the heart and to favor the elimination of the substance that is irritating it. The increased blood pressure throughout the body may be diminished by lessening the quantity of blood. This is obtained in some cases with advantage where the disease is but starting and the animal is plethoric by direct abstraction of blood, as in bleeding from the jugular or other veins; or by derivatives, such as mustard, turpentine, or blisters applied to the skin; or by setons, which draw to the surface the fluid of the blood, thereby lessening its volume, without having the disadvantage of impoverishing the elements of the blood found in bleeding. Antipyretics given by the mouth and cold applied to the skin are most useful in many cases.

When the irritation which is the cause of fever is a specific one, either in the form of bacteria, as in glanders, tuberculosis, influenza, septicemia, etc., or in the form of a foreign element, as in rheumatism, gout, hemaglobinuria, and other so-called diseases of nutrition, we employ remedies which have been found to have a direct specific action on them. Among the specific remedies for various diseases are counted quinine, carbolic acid, salicylic acid, antipyrine, mercury, iodine, the empyreumatic oils, tars, resins, aromatics, sulphur, and a host of other drugs, some of which are of known effect and others of which are theoretical in action. Certain remedies, like simple aromatic teas, vegetable acids, such as vinegar, lemon juice, etc., alkalines in the form of salts, sweet spirits of niter, etc., which are household remedies, are always useful, because they act on the excreting organs and ameliorate the effects of fever. Other remedies, which are to be used to influence the cause of fever, must be selected with judgment and from a thorough knowledge of the nature of the disease.—(Spl. Rpt. Horse, Dept. Agr. 1911.)

OSTEOPOROSIS OR BIGHEAD.

Osteoporosis is a general disease of the bones which develops slowly and progressively and is characterized by the absorption of the calcareous or compact bony substance and the formation of enlarged, softened, and porous bone. It is particularly manifest in the bones of the head, causing enlargement and bulging of the face and jaws, thereby giving rise to the terms bighead and swelled head, which are applied to it. The disease affects horses, mules, and asses of all ages, classes, and breeds, and of both sexes, and is found under all soil, dietetic, and climatic conditions. In the United States the disease has been found in all the States bordering the Delaware River and Chesapeake Bay, in some of the New England States, and in many of the Southern States, especially along the coast in regions of low altitude. In Europe the disease appears to be quite rare, and is usually described as a form of osteomalacia, a disease which is not uncommon among cattle of that continent. However, the opinion that bighead is only a form of osteomalacia can not be accepted, nor can the infrequency of the former among European horses and the frequency of the latter among other live stock be conceded on the argument which has been presented, namely, that the better care which horses receive prevents them from becoming affected. In the Southwest, where osteomalacia, or creeps, has not infrequently been observed by the writer among range cattle, no case of osteoporosis of the horses using the same range has been noted, although the latter animals are given no more attention than the cattle.



Like Produces Like. Two Views of Hind Leg of Wisconsin-Bred Mare, Showing Ringbones, Bone-Spavin and Other Bony Excrescences. Subject Was Progeny of an Old, Crippled Mare; at Three Years Developed a Bone Spavin Which Was "Fired;" at Four Years Developed Ringbones, and at Five Years Bony Growths Formed on Back of Leg. Animal Having Become Useless Was Destroyed. Dept. of Agr.

The appropriate treatment of osteomalacia in cattle is so effective that if osteoporosis were a similar manifestation of disease a similar line of treatment should prove equally efficacious. However, this is not the fact. On the other hand, the occurrence of osteomalacia on old, worn-out soil, or on land deficient in lime salts, or from eating feed lacking in these bone-forming substances, or drinking water with a lime deficiency, is in perfect accord with our knowledge of the disease. But osteoporosis may occur on rich, fertile soil, in the most hygienic stables, and in animals receiving the best of care and of bone-forming feeds with a proper amount of mineral salts in the drinking water.

Cause.—The cause of this disease still remains obscure, although various theories have been advanced, some entirely erroneous, others more or less plausible; but none of these has been established. Thus the idea that feeding fodder and cereals poor in mineral salts and grazing in pastures where the soil is poor in lime and phosphates will cause the disease has been entirely disproved in many instances. Others have considered that the disease starts as a muscular rheumatism which is followed by an inflammatory condition of the bones, terminating in osteoporosis. The idea that the disease is contagious has been advanced by many writers, although no causative agent has been isolated. Numerous experiments have been made by inoculating the blood of an affected horse into normal horses without results.

On some farms and in some stables bighead is quite prevalent, a number of cases following one after another. On one farm of thoroughbreds in Pennsylvania all the yearling colts and some of the aged horses were affected during one year, and on a similar farm in Virginia a large proportion of the horses for several years were diseased, although the cows and sheep of this farm remained unaffected.

Symptoms.—The commencement of the disease is usually unobserved by the owner, and those symptoms which do develop are generally not well marked or are misleading unless other cases have been noted in the vicinity. Until the bones become enlarged the symptoms remain so vague as not to be diagnosed readily. The disease may present itself under a variety of symptoms. If the bones of the hock become affected, the animal will first show a hock lameness. If the long bones are involved, symptoms of rheumatism will be the first observed, while if the dorsal or lumbar vertebræ are affected indications of a strain of the lumbar region are in evidence. Probably the first symptom to be noticed is a loss of vitality combined with an irregular appetite or other digestive disturbance, and with a tendency to stumble while in action. These earlier symptoms, however, may pass unobserved, and the appearance of an intermittent or migratory lameness without any visible cause may be the first sign to attract attention. This shifting and indefinite lameness, involving first one leg and then the other, is very suggestive, and is even more important when it is associated with a tendency to lie down frequently in the stall and the absence of a desire to get up, or the presence of evident pain and difficulty in arising.

About this time, or probably before, swelling of the bones of the face and jaw, which is almost constantly present in this disease, will be observed. The bones of the lower jaw are the most frequently involved, and this condition is readily detected with the fingers by the bulging ridge of the bone outside and along the lower edge of the molar teeth. A thickening of the lower jawbone may likewise be identified by feeling on both sides of each branch at the same time and comparing it with the thinness of this bone in a normal horse. As a result mastication becomes difficult or impossible and the teeth become loose and painful. The imperfect chewing which follows causes balls of food to form which drop out of the mouth into the manger. Similar enlargements of the bones of the upper jaw may be seen, causing a widening of the face and a bulging of the bones about midway between the eyes and the nostrils. In some cases the nasal bones also become swollen and deformed, which together with the bulging of the bones under the eyes, gives a good illustration of the reason for the application of the term bighead.

Other bones of the body will undergo similar changes, but these alterations are not so readily noted except by the symptoms they occasion. The alterations of the bones of the spinal column and the limbs, while difficult of observation, are nevertheless indicated by the reluctance of the animal to get up and the desire to remain lying for long periods of time. The animal easily tires, moves less rapidly, and if urged to go faster may sustain a fracture or have a ligament torn from its bony attachments, especially in the lower bones of the leg.

The animal becomes poor in flesh, the coat is rough and lusterless, and the skin tight and harsh, producing a condition termed hidebound, with considerable tucking up of the abdomen. The horse shows a short, stilted, choppy gait, which later becomes stiffer and more restricted, while on standing a position simulating that in founder is assumed, with a noticeable drop to the croup. The animal at this stage usually lies down and remains recumbent for several days at a time. Bed sores frequently arise and fractures are not uncommon in consequence of attempts to arise, which complications, in addition to emaciation, result in death.

The disease may exist in this manner for variable periods extending from two or three months to two years. The termination of the disease is uncertain at best, but is likely to be favorable if treatment and a change of feed, water, and location is adopted in the early stages of the malady.

Treatment.—The affected animal should be immediately placed under new conditions, both as to feed and surroundings. If the horse has been stable fed, it is advisable to turn it out on grass for two or three months, preferably in a higher altitude. If the disease has been contracted while running on pasture, place the animal in the stable or corral. In the early stages of the disease beneficial results have followed the supplemental use of lime given in the drinking water. One peck of lime slaked in a cask of water and additional water added from time to time is satisfactory and can be provided at slight expense. This treatment may be supplemented by giving a tablespoonful of powdered bone meal in each feed, with free access to a large piece of rock salt, or the bone meal may be given with four tablespoonfuls of molasses mixed with the feed. Feeds containing mineral salts, such as beans, cowpeas, oats, and cotton-seed meal, may prove beneficial in replenishing the bony substance that is being absorbed. Cotton-seed meal is one of the best feeds for this purpose, but it should be fed carefully. The animal should not be allowed to work at all during the active stage of the disease, nor should it be used for breeding purposes.—(Spl. Rpt. Horse, Dept. Agr. 1911; Fla. E. S. B. 26.)

DISEASES OF THE DIGESTIVE ORGANS.

WATER.

It is generally held, at least in practice, that any water that stock can be induced to drink is sufficiently pure for their use. This practice occasions losses that would startle us if statistics were at hand. Water that is impure from the presence of decomposing organic matter, such as is found in wells and ponds in close proximity to manure heaps and cesspools, is frequently the cause of diarrhea, dysentery, and many other diseases of stock, while water that is impregnated with different poisons produces death in very many instances.

Considering first the quantity of water required by the horse, it may be stated that when our animals have access to water continually they never drink to excess. Were the horse subjected to ship voyages or any other circumstances where he must depend upon his attendant for the supply of water, it may be roughly stated that each horse requires a daily average of about 8 gallons of water. This will vary somewhat upon the character of his food; if upon green food, less water will be needed than when fed upon dry hay and grain.

The time of giving water should be carefully studied. At rest, the horse should receive water at least three times a day; when at work, more frequently. The rule should be to give in small quantities and often. There is a popular fallacy that if a horse is warm he should not be allowed to drink, many claiming that the first swallow of water founders the animal or produces colic. This is erroneous. No matter how warm a horse may be, it is always entirely safe to allow him from six to ten swallows of water. If this is given on going into the stable, he should be given at once a pound or two of hay and allowed to rest about an hour before feeding. If water be now offered him it will in many cases be refused, or at least he will drink but sparingly. The danger, then, is not in the first swallow of water, but is due to the excessive quantity that the animal will take when warm if he is not restrained.

Water should never be given to horses when it is ice cold. It may not be necessary to add hot water, but the farmer should be careful in placing water troughs about his barns to have them in such position that the sun may shine upon the water during the winter mornings. Water, even though it be thus cold, seldom produces serious trouble if the horse has not been deprived for a too great length of time.

In reference to the purity of water, Smith, in his "Veterinary Hygiene," classes spring water, deep-well water, and upland surface water as wholesome; stored rain water and surface water from cultivated land, as suspicious; river water to which sewage gains access and shallow-well water, as dangerous. The water that is used for drinking purposes for stock so largely throughout some States can not but be impure. Reference is made to those sections where there is an impervious clay subsoil. It is the custom to scoop, or hollow out, a large basin in the pastures. During rains these basins become filled with water. The clay subsoil, being almost impervious, acts as a jug, and there is no escape for the water except by evaporation. Such water is stagnant, but would be kept comparatively fresh by subsequent rains were it not for the fact that much organic matter is carried into it by surface drainage during each succeeding storm. This organic matter soon undergoes decomposition, and, as the result, we find diseases of different kinds much more prevalent where this water is drunk than where the water supply is wholesome. Again, it must not be lost sight of that stagnant surface water is much more certainly contaminated than is running water by one diseased animal of the herd, thus endangering the remainder.

The chief impurities of water may be classified as organic and inorganic. The organic impurities are either animal or vegetable substances. The salts of the metals are the inorganic impurities. Lime causes hardness of water, and occasion will be taken to speak of this when describing intestinal concretions. Salts of lead, iron, and copper are also frequently found in water, and will be referred to hereafter. About the only examination of water that can be made by the average stock raiser is to observe its taste, color, smell, and clearness. Pure water is clear and is without taste or smell.

KINDS OF FOOD.

In this country horses are fed chiefly upon hay, grass, corn fodder, roots, oats, corn, wheat and rye. Many think that they could be fed on nothing else. Stewart, in "The Stable Book," gives the following extract from Loudon's Encyclopedia of Agriculture, which is of interest at this point:

In some sterile countries they (horses) are forced to subsist on dried fish, and even on vegetable mold; in Arabia, on milk, flesh balls, eggs, broth. In India horses are variously fed. The native grasses are judged very nutritious. Few, perhaps no, oats are grown; barley is rare, and not commonly given to horses. In Bengal a vetch, something like the tare, is used. On the western side of India a sort of pigeon pea, called gram, forms the ordinary food, with grass while in season, and hay all the year round. Indian corn or rice is seldom given. In the West Indies maize, guinea corn, sugarcorn tops, and sometimes molasses are given. In the Mahratta country, salt, pepper, and other spices are made into balls, with flour and butter, and these are supposed to produce animation and to fine the coat. Broth made from sheep's head is sometimes given. In France, Spain, and Italy, besides the grasses, the leaves of limes, vines, the tops of acacia, and the seeds of the carob tree are given to horses.

The age and health of the animal will, of course, modify the digestibility of foods, as will also the manner and time of harvesting, preserving, and preparing the foods.

In the horse digestion takes place principally in the intestines, and here, as in all other animals and with all foods, it is found that a certain part only of the provender is digested; another portion is undigested. This proportion of digested and undigested food must claim passing notice at least, for if the horse receives too much food, or bulky food containing much indigestible waste, a large portion of food must pass out unused, entailing not only the loss of this unused food, but also calling for an unnecessary expenditure of vital force on the part of the digestive organs of the horse. It is thus that, in fact, too much food may make an animal poor.

In selecting food for the horse we should remember the anatomical arrangement of the digestive organs, as well as the physiological functions performed by each one of them. Foods must be wholesome, clean, and sweet, the hours of feeding regular, the mode of preparation found by practical experience to be the best must be adhered to, and cleanliness in preparation and administration must be observed.

The length of time occupied by stomach digestion in the horse varies with the different foods. Hay and straw pass out of the stomach more rapidly than oats. It would seem to follow, then, that oats should be given after hay, for if reversed the hay would cause the oats to be sent onward into the intestines before being fully acted upon by the stomach, and as a result produce indigestion. Experience confirms this. There is another good reason why hay should be given first, particularly if the horse is very hungry or if exhausted from overwork, namely, it requires more time in mastication (insuring proper admixture of saliva) and can not be bolted, as are the grains. In either instance water must not be given soon after feeding, as it washes or sluices the food from the stomach before it is fitted for intestinal digestion. The stomach begins to empty itself very soon after the commencement of feeding, and continues rapidly while eating. Afterwards the passage is slower, and several hours are required before the stomach is entirely empty. The nature of the work required of the horse must guide us in the selection of his food. Rapid or severe labor can not be performed on a full stomach. For such labor food must be given in small quantity and about two hours before they go to work. Even horses intended for slow work must never be engorged with bulky, innutritious food immediately before going to labor. The small stomach of the horse would seem to lead us to the conclusion that this animal should be fed in small quantities and often, which, in reality, should be done. The disproportion between the size of the stomach and the amount of water drank tells us plainly that the horse should always be watered before feeding. One of the common errors of feeding, and the one that produces more digestive disorders than any other, is *to feed too soon after a hard day's work.* This must never be done. If a horse is completely jaded, it will be found beneficial to give him an alcoholic stimulant on going into the stable. A small quantity of hay may then be given, but his grain should be withheld for one or two hours. These same remarks will apply with equal force to the horse that for any reason has been fasting for a long time. After a fast, feed less than the horse would eat; for if allowed too much the stomach becomes engorged, and colic is almost sure to follow. The horse should be fed three or four times a day. It will not answer to feed him entirely upon concentrated food. Bulky food must be given to detain the grains in their passage through the intestinal tract; bulk also favors distention, and thus mechanically aids absorption. For horses that do slow work for the greater part of the time, chopped or cut hay fed with crushed oats, ground corn, etc., is the best manner of feeding, as it gives the required bulk, saves time, and half the labor of feeding.

Sudden changes of diet are always dangerous. When desirous of changing the food, do so very gradually. If a horse is accustomed to oats, a sudden change to a full meal of corn will almost always sicken him. If we merely intend to increase the quantity of the usual feed, this also must be done gradually. The quantity of food given must always be in proportion to the amount of labor to be performed. If a horse is to do a small amount of work, or rest entirely from work for a few days, see that he receives a proportionate amount of feed. If this should be observed even on Saturday night and Sunday, there would be fewer cases of "Monday morning sickness," such as colics and lymphangitis. Foods should also be of a more laxative nature when the horse is to stand for some days.

Musty or Moldy Foods.—Above all things, avoid feeding musty or moldy foods. These are very frequent causes of disease of different kinds. Lung trouble, such as bronchitis and heaves, often follows the use of such food. The digestive organs always suffer from moldy or musty foods. Musty hay is generally considered to produce disorder of the kidneys. It has often been said to produce that peculiar disease known variously as cerebro-spinal meningitis, putrid sore throat, or choking distemper.

PREPARATION OF FOODS.

Foods are prepared for feeding for any of the following reasons: To render the food more easily eaten; to make it more digestible; to economize in amount; to give it some new property; and to preserve it. The different grains are more easily eaten when ground, crushed, or even boiled. Rye or wheat should never be given whole, and even of corn it is found that there is less waste when ground, and, in common with all grains, it is more easily digested than when fed whole.

Hay and fodder are economized when cut in short pieces. Not only will the horse eat the necessary amount in a shorter time, but it will be found that there is less waste, and the mastication of the grains (whole or crushed) fed with them is insured.

Reference has already been made to those horses that bolt their food, and it need only be remarked here that the consequences of such ravenous eating may be prevented if the grains are fed with cut hay, straw, or fodder. Long or uncut hay should also be fed, even though a certain amount of hay or straw is cut and fed mixed with grain.

One objection to feeding cut hay mixed with ground or crushed grains, and wetted, must not be overlooked during the hot months. Such food is apt to undergo fermentation if not fed directly after it is mixed; and the mixing trough even, unless frequently scalded and cleaned, becomes sour and enough of its scrapings are given with the food to produce wind colic. A small amount of salt should always be mixed with such food. Bad hay should never be cut simply because it insures a greater consumption of it; bad foods are dear at any price and should never be fed.

TEETH.

Dentition.—This covers the period during which the young horse is cutting his teeth—from birth to the age of five years. With the horse more difficulty is experienced in cutting the second or permanent teeth than with the first or milk teeth. There is a tendency among farmers and many veterinarians to pay too little attention to the teeth of young horses.

The mouths of young horses should be examined from time to time to see if one or more of the milk teeth are not remaining too long, causing the second teeth to grow in crooked, in which case the first teeth should be removed with the forceps.

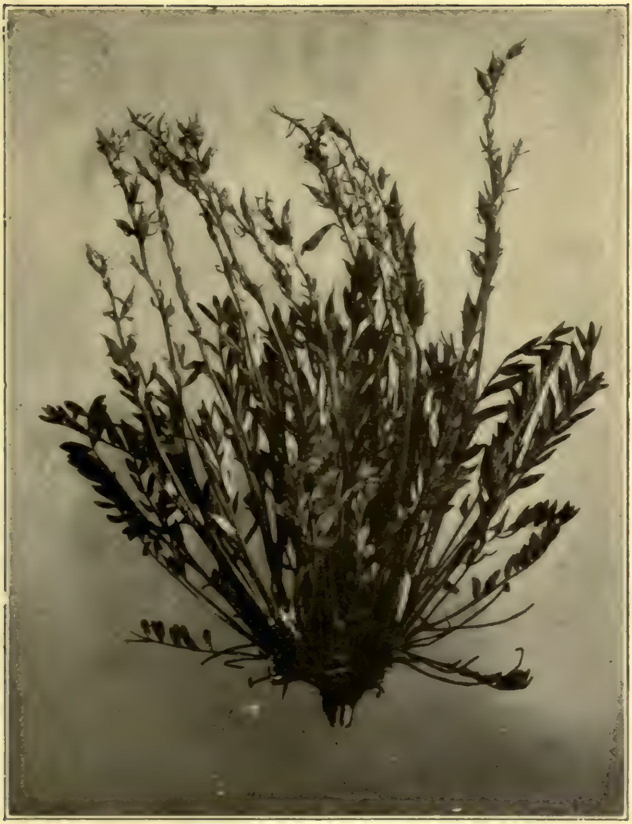
Irregularities of Teeth.—There is quite a fashion of late years especially in large cities, to have horses' teeth regularly floated, or rasped, by veterinary dentists. In some instances this is very beneficial, while in most cases it is entirely unnecessary. From the character of the food, the rubbing, or grinding, surface of the horse's teeth should be *rough.* Still, we must remember that the upper jaw is somewhat wider than the lower, and that, from the fact of the teeth not being perfectly apposed, a sharp ridge is left unworn on the inside of the lower molars and on the outside of the upper, which may excoriate the tongue or cheeks to a considerable extent. This condition can readily be felt by the hand, and these sharp ridges when found should be rasped down by a guarded rasp. In some instances the first or last molar tooth is unnaturally long, owing to the fact that its fellow in the opposite jaw has been lost or does not close perfectly against it. Should it be the last molar that is thus elongated, it will require the aid of the veterinary surgeon, who has the necessary forceps or chisel for cutting it. The front molar may be rasped down, if much patience is taken. In decay of the teeth it is quite common to find the tooth corresponding to the decayed one on the opposite jaw very much elongated, sometimes to such an extent that the mouth can not be perfectly closed. Such teeth must also be shortened by the tooth forceps, chisel, tooth saw, or rasp. In all instances where horses quid their food, where they are slobbering, or where they evince pain in mastication, shown by holding their head to one side while chewing, the teeth should be carefully examined. Horses whose teeth have unduly sharp edges are likely to drive badly; they pull to one side, do not bear on the bit, or bear on too hard and big, toss the head, and start suddenly when a tender spot is touched. If, as is mostly the case, all the symptoms are referable to sharp corners or projections of the teeth, these must be removed by the rasp. If decayed teeth are found, or other serious difficulty detected, or if the cause of the annoying symptoms is not discovered, an expert should be called.

Toothache.—This is rare in the horse and is mostly witnessed where there is decay of a tooth or inflammation about its root. Toothache is to be discovered in the horse by the pain expressed by him while feeding or drinking cold water. I have seen horses affected with toothache that would suddenly stop chewing, throw the head to one side, and slightly open the mouth. They behave as though some sharp body has punctured the mouth. If upon examination there is no foreign body found, we must then carefully examine each tooth. If this can not be done with the hand in the mouth, we can, in most instances, discover the aching tooth by pressing each tooth from without. By tapping the teeth in succession with a hard object, such as a small hammer, the one that is tender may be located. The horse will flinch when the sore tooth is pressed or tapped upon. In most cases there is nothing to be done but extract the decayed tooth, and this, of course, is only to be attempted by the veterinarian.

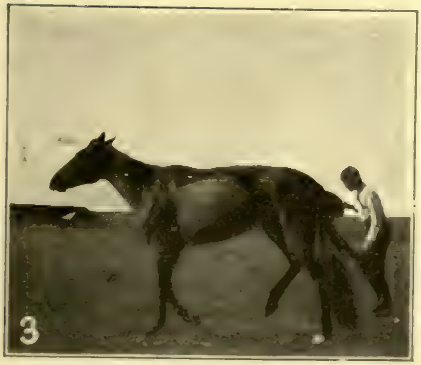
There is a deformity, known as parrot-mouth, that interferes with mastication, and, indirectly, with digestion. The upper incisors project in front of and beyond the lower ones. The teeth of both jaws become unusually long, as they are not worn down by friction. Such horses experience much difficulty in grazing. Little can be done except to occasionally examine the teeth, and if those of the lower jaw become so long that they bruise the bars of the upper jaw, they must be shortened by the rasp or saw. Horses with this deformity should never be left entirely at pasture.

DISEASES OF THE MOUTH.

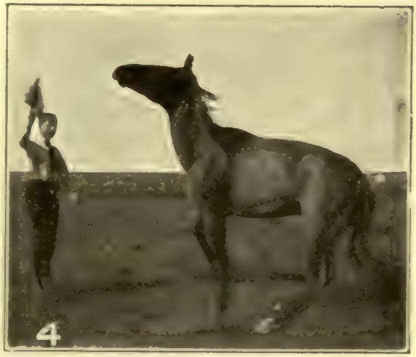
Lampas.—Lampas is the name given to a swelling of the mucous membrane covering the hard palate and projecting in a more or less prominent ridge immediately behind the upper incisors. The hard palate is composed of spongy tissue that fills with blood when the horse is feeding, and this causes the ridges to become prominent, and they then help to keep food from dropping from the mouth. This swelling is entirely natural and occurs in every healthy horse. Where there is some irritation in the mouth during teething the prominence of the hard palate may persist, due to the increased blood supply. In such cases the cause of the irritation should be sought for and removed. By way of direct treatment, slight scarification is the most that will be required. Burning the lampas is barbarous and injurious, and it should never be tolerated.



Loco Plant in Fruit. Dept. of Agr.



Peculiar Gait Shown. Loco Weed Disease. Dept. of Agr.



Rearing When Suddenly Started. Loco Weed Disease. Dept. of Agr.

It is quite a common opinion among owners of horses and stablemen that lampas is a disease that very frequently exists. In fact whenever a horse fails to eat, and if he does not exhibit very marked symptoms of a severe illness, they say at once he has the lampas. It is almost impossible to convince them to the contrary; yet it is not the case. It may be put down, then, as an affliction of the stableman's imagination rather than of the horse's mouth.

Stomatitis.—This is an inflammation of the mucous membrane lining the mouth and is produced by irritating medicines, foods, or other substances. The symptoms are swelling of the mouth, which is also hot and painful to the touch; there is a copious discharge of saliva; the mucous membrane is reddened, and in some cases there are observed vesicles or ulcers in the mouth. The treatment is simple, soft feed alone often being all that is necessary. A bucket of fresh cold water should be kept constantly in the manger so that the horse may drink or rinse his mouth at will. In some instances it may be advisable to use a wash of chlorate of potash, borax, or alum, about one-half ounce to a pint of water. Hay, straw, or oats should not be fed unless steamed or boiled. A form of contagious stomatitis sometimes occurs that is characterized by the formation within the mouth of small vesicles, or blisters. In this disease the horse should be isolated from other horses, and his stall, especially the feed box, and his bit should be disinfected.

Glossitis, or inflammation of the tongue, is very similar to stomatitis, and mostly exists with it and is due to the same causes. Injuries to the tongue may produce this simple inflammation of its covering membrane, or, if severe, may produce lesions much more extensive, such as lacerations, abscesses, etc. These latter would require surgical treatment, but for the simpler forms of inflammation of the tongue the treatment recommended for stomatitis should be followed.

Ptyalism, or salivation, consists in an abnormal and excessive secretion of saliva. This is often seen as a symptom of irregular teeth; inflammation of the mouth or tongue, or of the use of such medicines as lobelia, mercury, and many others. Some foods produce this, such as clover, and particularly second crop; foreign bodies, such as nails, wheat chaff, and corncobs becoming lodged in the mouth. If the cause is removed no further attention is necessary, as a rule. Astringent washes may be applied to the mouth as a gargle or by means of a sponge.

Paralysis of the Pharynx, or, as it is commonly called, paralysis of the throat, is a rare but very serious disease. The symptoms are as follows: The horse will constantly try to eat or drink, but will be unable to do so; if water be offered him from a pail he will apparently drink with avidity, but the quantity of water in the pail will remain about the same; he will continue trying to drink by the hour; if he can succeed in getting any fluid into the back part of the mouth it will come out at once through the nose. Foods also return through the nose, or are dropped from the mouth, quidded. An examination of the mouth by inserting the hand fails to find any obstruction or any abnormal condition. These cases go on from bad to worse; the horse constantly and rapidly loses in condition, becomes very much emaciated, the eyes are hollow, and death occurs.

Treatment is very unsatisfactory. A severe blister should be applied behind and under the jaw; the mouth is to be frequently swabbed out with alum, 1 ounce to a pint of water, by means of a sponge fastened to the end of a stick. Strychnia may be given in 1-grain doses two or three times a day.

This disease may be mistaken at times for foreign bodies in the mouth or for the so-called cerebro-spinal meningitis. It is to be distinguished from the former, upon a careful examination of the mouth, by the absence of any offending body and by the flabby feel of the mouth; and from the latter by the animal appearing in perfect health in every particular except this inability to eat or drink.

Abscesses sometimes form back of the pharynx and give rise to symptoms resembling those of laryngitis or distemper. Interference with breathing that is of recent origin and progression, without any observable swelling or soreness about the throat, will make one suspect the formation of an abscess in this location. But little can be done by the owner in the way of treatment, save to hurry the ripening of the abscess and its discharge by steaming with hops, hay, or similar substances and by poulticing the throat. The operation for opening an abscess in this region necessitates an intimate knowledge of the complex anatomy of the throat region.

DISEASES OF THE ESOPHAGUS, OR GULLET.

It is rare to find diseases of this organ, except as a result of the introduction of foreign bodies too large to pass or to the administering of irritating medicines. Great care should be taken in the administration of irritant or caustic medicines that they be thoroughly diluted. If this is not done erosions and ulcerations of the throat ensue, and this again is prone to be followed by narrowing of the gullet. The mechanical trouble of choking is quite common. It may occur when the animal is suddenly startled while eating apples or roots, and we should be careful never to approach suddenly or put a dog after horses or cows that are feeding upon such substances. If left alone these animals very rarely attempt to swallow the object until it is sufficiently masticated.

Choking also arises from feeding oats in a deep, narrow manger to such horses as eat very greedily or bolt their food. Wheat chaff is also a frequent cause of choke. This accident may result from the attempts to force eggs down without breaking or from giving balls that are too large or not of the proper shape.

Whatever object causes the choking, it may lodge in the upper part of the esophagus, at its middle portion, or close to the stomach, giving rise to the designations of pharyngeal, cervical, and thoracic choke. In some cases where the original obstruction is low we find all that part of the gullet above it to be distended with food.

The symptoms vary somewhat according to the position of the body causing choke. In pharyngeal choke the object is lodged in the upper portion of the esophagus. The horse will present symptoms of great distress, hurried breathing, frequent cough, excessive flow of saliva, sweating, trembling, or stamping with the fore feet. The abdomen rapidly distends with gas. The diagnosis is completed by manipulating the upper part of the throat from without and by the introduction of the hand into the back part of the mouth, finding the body lodged here. In cervical choke (where the obstruction is situated at any point between the throatlatch and the shoulder) the protrusion caused by the object can be seen and the object can be felt. The symptoms here are not so severe; the horse will be seen occasionally to draw himself up, arch his neck, and make retching movements as though he wished to vomit. Should there be any question as to the trouble a conclusion may be reached by pouring water into the throat from a bottle. If the obstruction is complete you can see the gullet become distended with each bottle of water by standing on the left side of the horse and watching the course of the esophagus, just above the windpipe. This is not always a sure test, as the obstruction may be an angular body, in which case liquids would pass it. Solids taken would show in these cases; but solids should not, however, be given, as they serve to increase the trouble by rendering the removal of the body more difficult.

In thoracic choke the symptoms are less severe. Food or water may be ejected through the nose or mouth after the animal has taken a few swallows. There will be some symptoms of distress, fullness of the abdomen, cough, and occasionally retching movements. Sometimes a horse that is choking is heard to emit groans. The facial expression always denotes great anxiety and the eyes are bloodshot. The diagnosis is complete if, upon passing the probang (a flexible tube made for this purpose) an obstruction is encountered.

If the choke is at the beginning of the gullet (*pharyngeal*) an effort must be made to remove the obstacle through the mouth. A mouth-gag is to be introduced into the mouth to protect the hand and arm of the operator. Then, while an assistant, with his hands grasped tightly behind the object, presses it upward and forward with all his force, the operator must pass his hand into the mouth until he can seize the obstruction and draw it outward. This mode of procedure must not be abandoned with the first failure, as we may get the obstacle farther toward the mouth by continued efforts. If we fail with the hand, forceps may be introduced through the mouth and the object seized when it is just beyond the reach of the fingers. Should our efforts entirely fail, we must then endeavor to force the obstruction downward by means of the probang. This instrument, which is of such signal service in removing choke in cattle, is decidedly more dangerous to use for the horse; and I can not pass this point without a word of caution to those who have been known to introduce into the horse's throat such objects as whipstalks, shovel handles, etc. These are always dangerous, and more than one horse has been killed by such barbarous treatment.

Cervical Choke.—In this, as well as in thoracic choke, we must first of all endeavor to soften or lubricate the obstruction by pouring oil down the gullet. After this has been done endeavor to move the object by gentle manipulations with the hands. If choked with oats or chaff (and these are the objects that most frequently produce choke in the horse), begin by gently squeezing the lower portion of the impacted mass and endeavor to work it loose a little at a time. This is greatly favored at times if we apply hot fomentations immediately about the obstruction. Persist in these efforts for at least an hour before deciding to resort to other and more dangerous modes of treatment. If unsuccessful, however, the probang may be used. In the absence of the regular instrument, use a piece of inch hose 6 feet long, or a piece of new three-quarter-inch manila rope well wrapped at the end with cotton twine and thoroughly greased with tallow. The mouth is to be kept open by a gag of wood or iron and the head slightly raised and extended. The probang is then to be carefully guided by the hand into the upper part of the gullet and gently forced downward until the obstruction is reached. Pressure must then be gradual and firm. Do not at first attempt too much force, or the esophagus will be ruptured. Simply keep up this firm, gentle pressure until you feel the object moving, after which you are to follow it rapidly to the stomach. If this mode of treatment is unsuccessful, a veterinarian or physician is to be called in, who can remove the object by cutting down upon it. This should scarcely be attempted by a novice, as a knowledge of the anatomy of the parts is essential to avoid cutting the large artery, vein, and nerve that are closely related to the esophagus in its cervical portion.

Thoracic Choke.—Thoracic choke can be treated only by means of the introduction of oils, and the careful use of the probang.

Stricture of the Esophagus.—This is due to corrosive medicines, previous choking (accompanied by lacerations, which, in healing, narrow the passage), or pressure on the gullet by tumors. In the majority of cases of stricture, dilatation of the gullet in front of the constricted portion soon occurs. This dilatation is due to the frequent accumulation of solid food above the constriction. Little can be done in either of these instances except to feed on sloppy or liquid food.

Sacular Dilatation of the Esophagus.—This follows choking, and is due to stretching or rupture of the muscular coat of the gullet, allowing the internal, or mucous, coat to protrude through the lacerated muscular walls. Such a dilatation, or pouch, may gradually enlarge from the frequent imprisonment of food. When liquids are taken, the solid materials are partially washed out of the pouch.

The symptoms are as follows: The horse is able to swallow a few mouthfuls of food without apparent difficulty; then he will stop feeding, paw, contract the muscles of his neck and eject a portion of the food through his nose or mouth, or it will gradually work down to the stomach. As the dilatation thus empties itself the symptoms gradually subside, only to reappear when he has again taken solid food. Liquids pass without any, or but little, inconvenience. Should this dilatation exist in the cervical region, surgical interference may sometimes prove effectual; if in the thoracic portion, nothing can be done, and the patient rapidly passes from hand to hand by swapping, until at no distant date, the contents of the sac become too firm to be dislodged as heretofore, and the animal succumbs.

DISEASES OF THE STOMACH AND INTESTINES.

As a rule it is most difficult to distinguish between diseases of the stomach and of the intestines of the horse. The reason for this is that the stomach is relatively small. It lies away from the abdominal wall, and so pressure from without can not be brought to bear upon it to reveal sensitiveness or pain. Nor does enlargement, or distention, of the stomach produce visible alteration in the form of the abdomen of the horse. Moreover, it is a rule to which there are few exceptions that an irritant or cause of disease of the stomach acts likewise upon the intestines, so that it is customary to find them similarly deranged. For these reasons it is logical to discuss together the diseases of the stomach and intestines and to point out such localizations in one organ or another as are of importance in recognizing and treating the diseases of the digestive organs of the horse. It should be understood that gastritis signifies an inflammation of the stomach and enteritis an inflammation of the intestines. The two terms may be used together to signify a disease of the stomach and intestines, as gastro-enteritis.

COLIC.

The disease of the horse that is most frequently met with is what is termed colic, and many are the remedies that are reputed to be sure cures for this disease. Let us discover, then, what the word colic means. This term is applied loosely to almost all diseases of the organs of the abdomen that are accompanied by pain. If the horse evinces abdominal pain, he is likely to be put down as suffering with colic, no matter whether the difficulty be a cramp of the bowel, an internal hernia, overloading of the stomach, or a painful disease of the bladder or liver. Since these conditions differ so much in their causation and their nature, it is manifestly absurd to treat them alike and to expect the same drugs or procedures to relieve them all. Therefore it is important that the various diseased states that are so roughly classed together as colic shall, so far as possible, be separated and individualized in order that appropriate treatments may be prescribed. With this object in view, colics will be considered under the following headings: (1) Engorgement colic, (2) obstruction colic, (3) tympanitic colic, (4) spasmodic colic, (5) worm colic.

The general symptoms of abdominal pain, and therefore of colic, are restlessness, lying down, looking around toward the flank, kicking with the hind feet upward and forward toward the belly, jerky switching of the tail, stretching as though to urinate, frequent change of position, and groaning. In the more intense forms the horse plunges about, throws himself down, rolls, assumes unnatural positions, as sitting on the haunches, and grunts loudly. Usually the pain is not constant, and during the intermissions the horse may eat and appear normal. During the period of pain sweat is poured out freely. Sometimes the horse moves constantly in a circle. The respirations are accelerated, and usually there is no fever.

(1) ENGORGEMENT COLIC.—This form of colic consists in an overloading of the stomach with food. The horse may have been overfed or the food may have collected in the stomach through failure of this organ to digest it and pass it backward into the intestines. Even a normal amount of food that the horse is unaccustomed to may cause disease. Hence a sudden change of food may produce engorgement colic. Continued full rations while the horse is resting for a day or two or working too soon after feeding may serve as a cause. New oats, corn, or hay, damaged food, or food difficult of digestion, such as barley or beans, may incite engorgement colic. This disease may result from having fed the horse twice by error or from its having escaped and taken an unrestricted meal from the grain bin. Ground feeds that pack together making a sort of dough may cause engorgement colic if they are not mixed with cut hay. Greedy eaters are predisposed to this disease.

Symptoms.—The horse shows the general signs of abdominal pain, which may be long continued or of short duration. Retching or vomiting movements are made; these are shown by labored breathing, upturned upper lip, contraction of the flank, active motion at the throat, and drawing in of the nose toward the breast, causing high arching of the neck. The horse may assume a sitting position on his haunches, like a dog. At times the pain is very great and the horse makes the most violent movements, as though mad. At other times there is profound mental depression, the horse standing in a sleepy, or dazed, way, with the head down, the eyes closed, and leaning his head against the manger or wall. There is, during the struggles, profuse perspiration. Following retching, gas may escape from the mouth, and this may be followed by a sour froth and some stomach contents. The horse can not vomit except when the stomach is violently stretched, and, if the accumulation of food or gas is great enough to stretch the stomach so that vomiting is possible, it may be great enough to rupture this organ. So it happens not infrequently that a horse will die from ruptured stomach after vomiting. But after the stomach ruptures vomiting is impossible. The death rate in this form of colic is high.

Treatment.—The bowels should be stimulated to contraction by the use of large quantities of water and of glycerin. It is not profitable to give remedies by the stomach, for they can not be absorbed. But small doses of morphine (5 grains) may be placed in the mouth and are absorbed in part, at least, without passing to the stomach. This drug lessens pain and thus helps to overcome the violent movements that are dangerous, because they may be the means of causing rupture of the diaphragm or stomach. If facilities are available, relief may be afforded by passing an esophageal tube through which some of the gaseous and liquid contents of the stomach may escape.

Rupture of the Stomach.—This mostly occurs as a result of engorged or tympanitic stomach and from the horse violently throwing himself when so affected. It may result from disease of the coats of the stomach, gastritis, stones, tumors, or anything that closes the opening of the stomach into the intestines, and very violent pulling or jumping immediately after the animal has eaten heartily of bulky food. These or similar causes may lead to this accident.

The symptoms of rupture of the stomach are not constant or always reliable. Always make inquiry as to what and how much the horse has been fed at the last meal. Vomiting may precede rupture of this organ, as stated above. This accident appears to be most likely to occur in heavy draft horses. A prominent symptom observed (though it may also occur in diaphragmatic hernia) is where the horse, if possible, gets the front feet on higher ground than the hind ones or sits on his haunches, like a dog. This position affords relief to some extent, and it will be maintained for some minutes; it is also quickly regained when the horse has changed it for some other. Colicky symptoms, of course, are present, and these will vary much and present no diagnostic value. As the case progresses the horse will often stretch forward the fore legs, lean backward and downward until the belly nearly touches the ground, and then rise up again with a groan, after which the fluid from his nostrils is issued in increased quantity. The pulse is fast and weak, breathing hurried, body bathed in a clammy sweat, limbs tremble violently, the horse reels or staggers from side to side, and death quickly ends the scene.

In the absence of any pathognomonic symptom we must take into account the history of the case; the symptoms of colic that cease suddenly and are succeeded by cold sweats and tremors; the pulse quick and small and thready; growing weak and more frequent, and at length running down and becoming altogether imperceptible; looking back at the flank and groaning; sometimes crouching with the hind quarters; with or without eructation and vomiting.

There is no treatment that can be of any use whatever. Could we be sure of our diagnosis it would be better to destroy the animal at once. Since, however, there is always the possibility of a mistake in diagnosis, we may give powdered opium in 1-dram doses every two or three hours, with the object of keeping the stomach as quiet as possible.

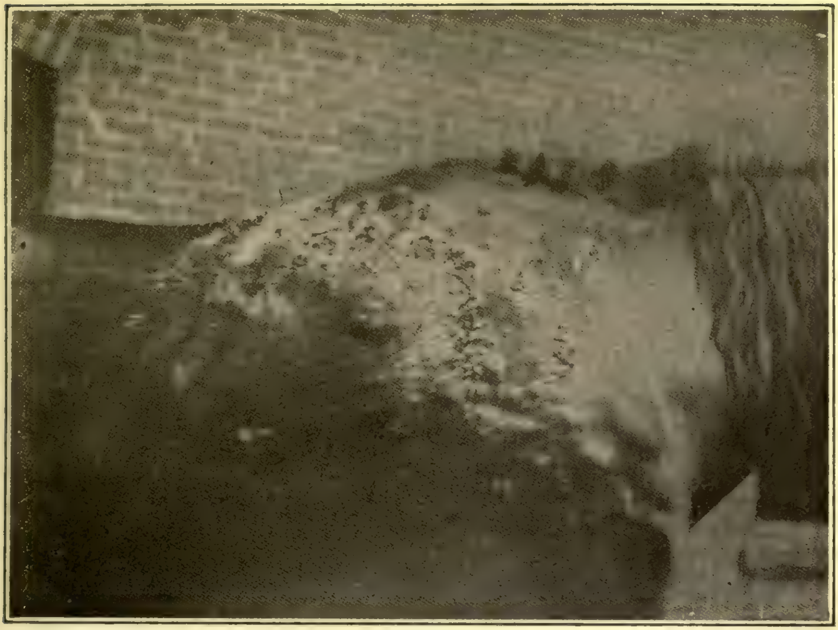
(2) OBSTRUCTION COLIC.—The stomach or bowels may be obstructed by accumulations of partly digested food, by foreign bodies, by displacements, by paralysis, or by abnormal growths.

Impaction of the Large Intestines.—This is a very common bowel trouble and one which, if not promptly recognized and properly treated, results in death. It is caused by overfeeding, especially of bulky food containing an excess of indigestible residue; old, dry, hard hay, or stalks when largely fed; deficiency of secretions of the intestinal tracts; lack of water; want of exercise, medicines, etc.

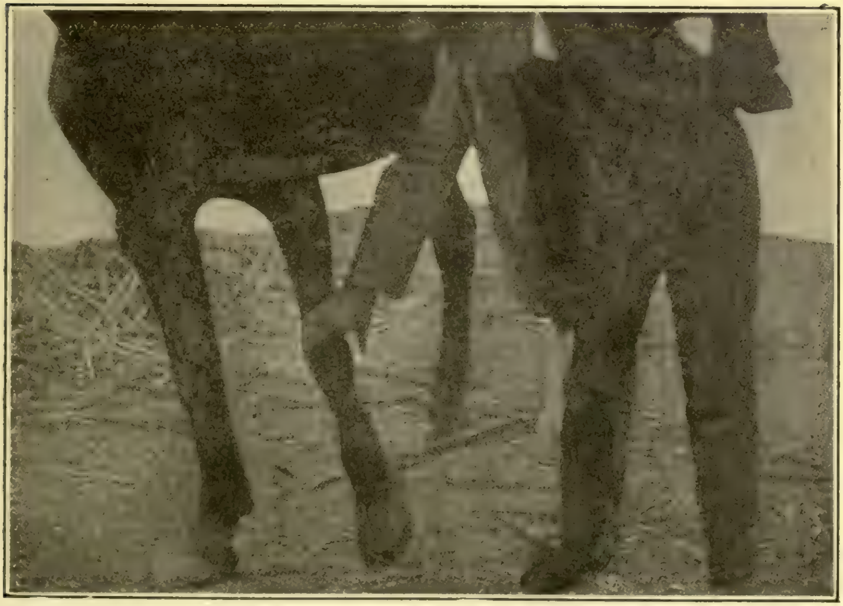
Symptoms.—Impaction of the large bowels is to be diagnosed by a slight abdominal pain, which may disappear for a day or two to reappear with more violence. The feces are passed somewhat more frequently, but in smaller quantities and more dry; the abdomen is full, but not distended with gas; the horse at first is noticed to paw and soon begins to look back at his sides. Probably one of the most characteristic symptoms is the position assumed when down. He lies flat on his side, head and legs extended, occasionally raising his head to look toward his flank; he remains on his side from five to fifteen minutes at a time. Evidently this position is the one giving the most freedom from pain. He rises at times, walks about the stall, paws, looks at his sides, backs up against the stall, which he presses with his tail, and soon lies down again, assuming his favored position. The intestinal sounds, as heard by applying the ear to the flank, are diminished, or there is no sound, indicating absence of motion of the bowels. The bowels may cease entirely to move. The pressure of the distended intestine upon the bladder may cause the horse to make frequent attempts to urinate. The pulse is but little changed at first, being full and sluggish; later, if this condition is not overcome, it becomes rapid and feeble. Horses may suffer from impaction of the bowels for a week, yet eventually recover, and cases extending two or even three weeks have ended favorably. As a rule, however, they seldom last over four or five days, many, in fact, dying sooner than this.

The treatment consists of efforts to produce movement of the bowels and to prevent inflammation of the same from arising. A large cathartic is to be given as early as possible. Either of the following is recommended: Powdered Barbados aloes 1 ounce, calomel 2 drams, and powdered nux vomica 1 dram; or linseed oil 1 pint and croton oil 15 drops; or from 1 pint to one quart of castor oil may be given. Some favor the administration of Epsom or Glauber's salts, 1 pound, with one-quarter pound of common salt, claiming that this causes the horse to drink largely of water, and thus mechanically softening the impacted mass and favoring its expulsion. Whichever physic is selected, it is essential that a full dose be given. This is much better than small and repeated doses. It must be borne in mind that horses require about twenty-four hours in which to respond to a physic, and under no circumstances are physics to be repeated sooner than this. If aloes has been given and has failed to operate at the proper time, oil or some different cathartic should then be administered. Allow the horse all the water he will drink. Calomel may be administered in half-dram doses, the powder being placed on the tongue, one dose every two hours until four doses are given.

Enemas of glycerin, 2 to 4 ounces, are often beneficial. Rubbing or kneading of the abdominal walls and the application of stimulating liniments or strong mustard water will also, at times,



Farcy Affecting Skin of Shoulder. B. A. I. 1910.



Mycotic Lymphangitis on Fore Leg and Shoulder of Horse. B. A. I. 25th Rpt.

favor the expulsion of this mass. Walking exercise must occasionally be given. If this treatment is faithfully carried out from the start the majority of cases will terminate favorably. Where relief is not obtained inflammation of the bowels may ensue, and death follow from this cause.

Constipation, or Costiveness.—This is often witnessed in the horse, and particularly in the foal. Many colts die every year from failure on the part of the attendant to note the condition of the bowels soon after birth. Whenever the foal fails to pass any feces, and in particular if it presents any signs of colicky pains—straining, etc.,—immediate attention must be given it. As a rule, it will only be necessary to give a few injections of soapy water in the rectum and to introduce the finger through the anus to break down any hardened mass of dung found there. If this is not effective, a purgative must be given. Oils are the best for these young animals, and preferably castor oil, giving from 2 to 4 ounces. The foal should always get the first of the mother's milk, as this milk, for a few days, possesses decided laxative properties. If a mare, while suckling, is taking laudanum, morphine, or similar medicines, the foal should be fed during this time by hand and the mare milked upon the ground. Constipation in adult horses is often the result of long feeding on dry, innutritious food, deficiency of intestinal secretions, scanty water supply, or lack of exercise. If the case is not complicated with colicky symptoms, a change to light, sloppy diet, linseed gruel or tea, with plenty of exercise, is all that is required. In very many instances the constipated condition of the bowels is due to lack of intestinal secretions, and when so due, may be treated by giving fluid extract of belladonna three times a day in 2-dram doses, and handful doses daily of Epsom salts in the feed. It is always best, when possible, to overcome this trouble by a change of diet rather than by the use of medicines. For the relief of constipation such succulent foods as roots, grass, or green forage are recommended. Silage, however, should be fed sparingly, and not at all unless it is in the very best condition. Moldy silage may cause fatal disease.

Foreign Bodies (Calculi (Stones) in the Stomach).—There are probably but few symptoms exhibited by the horse that will lead one to suspect the presence of gastric calculi, and possibly none by which we can unmistakably assert their presence. Stones in the stomach have been most frequently found in millers' horses fed sweepings from the mill. A depraved appetite is common in horses that have a stone forming in their stomach. There is a disposition to eat the woodwork of the stable, earth, and, in fact, almost any substance within their reach. Occasional colics may result from these "stomach stones," and when these lodge at the outlet of the stomach they may give rise to symptoms of engorged stomach, already described. There is, of course, no treatment that will prove effective. Give remedies to move the bowels, to relieve pain, and to combat inflammation.

Intestinal Concretions (Calculi (Stones) in the Intestines).—These concretions are usually found in the large bowels, though they are occasionally met with in the small intestines. They are of various sizes, weighing from 1 ounce to 25 pounds; they may be single or multiple, and differ in composition and appearance, some being soft (composed mostly of animal or vegetable matter), while others are porous, or honeycombed (consisting of animal and mineral matter), and others are entirely hard and stonelike. The hair balls, so common to the stomach and intestines of cattle, are very rare in the horse. Intestinal calculi form around some foreign body, as a rule—a nail or piece of wood—whose shape they may assume to a certain extent. Layers are arranged concentrically around such nucleus until the sizes above spoken of are attained. These stones are also often found in millers' horses, as well also as in horses in limestone districts, where the water is hard. When the calculi attain a sufficient size and become lodged or blocked in some part of the intestines, they cause obstruction, inflammation of the bowels, colicky symptoms, and death. There are no certain signs or symptoms that reveal them. Recurring colics of the type of impaction colic, but more severe, may lead one to suspect the existence of this condition. Examination through the rectum may reveal the calculus.

The symptoms will be those of obstruction of the bowels. Upon post-mortem examinations these stones will be discovered mostly in the large bowels; the intestines will be inflamed or gangrenous about the point of obstruction. Sometimes calculi have been expelled by the action of a physic, or they may be removed by the hand when found to occupy the rectum.

As in concretions of the stomach, there can be but little done in the way of treatment more than to overcome spasm (if any exists), and to give physics with the hope of dislodging the stone or stones and carrying them on and outward.

Intussusception, or Invagination.—This is the slipping of a portion of the intestine into another portion immediately adjoining, like a partially turned glove finger. This may occur at any part of the bowels, but is most frequent in the small guts. The invaginated portion may be slight—2 or 3 inches only—or extensive, measuring as many feet. In intussusception, the inturned bowel is in the direction of the anus. There are adhesions of the intestines at this point, congestion, inflammation, or even gangrene. This accident is most likely to occur in horses that are suffering from spasm of the bowel, or in those where a small portion of the gut is paralyzed. The natural wormlike or ringlike contraction of the gut favors the passage of the contracted or paralyzed portion into that immediately behind it. It may occur during the existence of almost any abdominal trouble, as diarrhea, inflammation of the bowels, or from injuries, exposure to cold, etc. A fall or leaping may give the initial maldirection. Foals are most likely to be thus afflicted.

Symptoms.—Unless the invaginated portion of the gut becomes strangulated, probably no symptoms will be appreciable, except constipation. Strangulation of the bowel may take place suddenly, and the horse die within twenty-four hours, or it may occur after several days—a week even—and death follow at this time. There are no symptoms positively diagnostic. Colicky pains, more or less severe and continuous, are observed, and there may be at first diarrhea followed by constipation. Severe straining occurs in some instances of intussusception, and this should be given due credit when it occurs. As death approaches the horse sweats profusely, sighs, presents an anxious countenance, the legs and ears become cold, and there is often freedom from pain immediately before death. In some rare instances the horse recovers, even though the invaginated portion of the gut has become strangulated. In this case the imprisoned portion sloughs away so gradually that a union has taken place between the intestines at the point where one portion has slipped into that behind it. The piece sloughing off is found passed with the manure. Such cases are exceedingly rare. Nonirritating laxatives, such as castor oil, sweet oil, or calomel in small doses should be given, and creolin in 2-dram doses in a pint of warm water. Soft feed and mucilaginous and nourishing drinks should be given during these attacks.

Volvulus, Gut-tie, or Twisting of the Bowels.—These are the terms applied to the bowels when twisted or knotted. This accident is rather a common one, and frequently results from the violent manner in which a horse throws himself about when attacked by spasmodic colic. The symptoms are the same as those of intussusception and obstructions of the bowels; the same directions as to treatment are therefore to be observed.

Paralysis of the Intestine.—This occurs in old, debilitated animals that have been fed on coarse innutritious fodder. This produces a condition of dilatation so pronounced as to make it impossible for the intestine to advance its contents, and so obstruction results. The symptoms are as in other forms of obstruction colic. The history of the case is of much service in diagnosing the trouble. The treatment consists in the administration of laxatives. One may give 1 quart of raw linseed oil and follow it the next day with 1 pound of Glauber's salts dissolved in a quart of warm water. Strychnia may be given in doses of 1 grain two or three times daily. If the stagnant mass of feces is in the rectum, it must be removed with the hand.

Abnormal Growths, such as tumors, producing contraction or stricture may be causes of obstruction. The colic caused by these conditions is chronic. The attacks occur at gradually shortening intervals and become progressively more severe. Relief is afforded by the use of purgatives that render the feces soft and thin and thus enable them to pass the obstruction. But in time the contracted place is likely to close so far that passage is impossible and the horse will die.

(3) FLATULENT COLIC (TYMPANITIC COLIC, WIND COLIC, OR BLOAT).—Among the most frequent causes of this form of colic are to be mentioned sudden changes of food, too long fasting, food then

given while the animal is exhausted, new hay or grain, large quantities of green food, food that has lain in the manger for some time and become sour, indigestible food, irregular teeth, crib-biting, and, in fact, anything that produces indigestion may produce flatulent colic.

The symptoms of wind colic are not so suddenly developed nor so severe as those of cramp colic. At first the horse is noticed to be dull, paws slightly, and may or may not lie down. The pains from the start are continuous. The belly enlarges, and by striking it in front of the haunches a drumlike sound results. If not soon relieved the above symptoms are aggravated, and in addition there are noticed difficult breathing, bloodshot eyes, and red mucous membranes, loud tumultuous heart beat, profuse perspiration, trembling of front legs, sighing respiration, staggering from side to side, and, finally, plunging forward dead. The diagnostic symptoms of flatulent colic is the distention of the bowels with gas, detected by the bloated appearance and resonance on percussion.

The treatment for wind colic differs very materially from that of cramp colic. Absorbents are of some service, and charcoal may be given in any quantity. Relaxants and antispasmodics are also beneficial in this form of colic. Chloral hydrate not only possesses these qualities, but it also is an antiferment and a pain reliever. It is then particularly well adapted to the treatment of wind colic, and should be given in the same-sized doses and in the manner directed for spasmodic colic. Diluted alcohol or whisky may be given, or aromatic spirits of ammonia in 1-ounce doses at short intervals.

A physic should always be given in flatulent colic as early as possible, the best being Barbados aloes in the dose already mentioned. Injections, per rectum, of turpentine 1 to 2 ounces, linseed oil 8 ounces, may be given frequently to stimulate the motion of the bowels and favor the escape of wind. Blankets wrung out of hot water do much to afford relief; they should be renewed every five or ten minutes and covered with a dry woolen blanket. This form of colic is much more fatal than cramp colic; and requires prompt and persistent treatment. It is entirely unsafe to predict the result, some apparently mild attacks going on to speedy death, while others that appear at the onset to be very severe yielding rapidly to treatment. Do not cease your efforts until you are sure the animal is dead. In these severe cases puncturing of the bowels in the most prominent part by means of a small trocar and cannula or with a needle of a hypodermic syringe, thus allowing the escape of gas, has often saved life, and such punctures, if made with a clean, sharp instrument that is not allowed to remain in the horse too long, are accompanied by little danger and do more to quickly relieve the patient than any other treatment.

(4) SPASMODIC, OR CRAMP, COLIC.—This is the name given to that form of colic produced by contraction, or spasm, of a portion of the small intestines. It is produced by indigestible food; large drinks of cold water when the animal is warm; driving a heated horse through deep streams; cold rains; drafts of cold air, etc. Un-

equal distribution of or interference with the nervous supply here produces cramp of the bowels, the same as external cramps are produced. Spasmodic colic is much more frequently met with in highbred, nervous horses than in coarse, lymphatic ones.

Symptoms.—These should be carefully studied in order to diagnose this from other forms of colic requiring quite different treatment. Spasmodic colic always begins suddenly. If feeding, the horse is seen to stop abruptly, stamp impatiently, and probably look back. He soon evinces more acute pain, and this is shown by pawing, suddenly lying down, rolling, and getting up. During the period of pain the intestinal sounds, as heard by applying the ear over the flank, are louder than in health. There is then an interval of ease; he will resume feeding and appear to be entirely well. In a little while, however, the pains return and are increased in severity, only to again pass off for a time. As the attack progresses these intervals of ease become shorter and shorter, and pain may be continuous. Animals suffering from this form of colic evince the most intense pain; they throw themselves down, roll over and over, jump up, whirl about, drop down again, paw, or strike rather, with the front feet, steam and sweat, and make frequent attempts to pass their urine. Only a small amount of water is passed at a time, and this is due to the bladder being so frequently emptied. These attempts to urinate are often regarded by horsemen as symptoms of trouble of the kidneys or bladder. In reality they are only one of the many ways in which the horse expresses the presence of pain. As a matter of fact, diseases of the bladder or kidneys of the horse are exceedingly rare.

To recapitulate the symptoms of spasmodic colic: Keep in mind the history of the case, the type of horse, the suddenness of the attack, the increased intestinal sounds, the intervals of ease, the violent pain, the normal temperature and pulse during the intervals of ease, the frequent attempts to urinate, etc., and there is but little danger of confounding this with other forms of colic.

Treatment.—Since the pain is due to spasm, or cramp, of the bowels, medicines that overcome spasms are the ones indicated. Chloral hydrate may be used. This is to be given in a dose of 1 ounce in a pint of water as a drench. As this drug is irritant to the throat and stomach, it has to be well diluted. A common and good remedy is sulphuric ether and laudanum; of each 2 ounces in a half pint of linseed oil. Another drench may be composed of 2 ounces each of sulphuric ether and alcohol in 8 ounces of water. If nothing else is at hand give whisky, one-half pint in hot water. Jamaica ginger is useful. If relief is not obtained in one hour from any of the above doses, they may then be repeated. The body should be warmly clothed and perspiration induced. Blankets dipped in very hot water to which a small quantity of turpentine has been added should be placed around the belly and covered with dry blankets, or the abdomen may be rubbed with stimulating liniments or mustard water. The difficulty, however, of applying hot blankets and keeping them in place forces us in most instances to dispense with them. If the cramp is due to irritants in the bowels, a cure is not complete until there is given a cathartic of 1 ounce of aloes or 1 pint of linseed oil. Injections into the rectum of warm soapy water or salt and water aid the cure.

Rectal injections, or enemas as a rule should be lukewarm, and from 3 to 6 quarts are to be given at a time. They may be repeated every half hour if necessary. Great care is to be taken not to injure the rectum in giving such injections. A piece of rubber hose 4 or 5 feet long, with a funnel attached at one end, affords the best means by which to give them. The pipe of the hose introduced into the rectum must be blunt, rounded, and smooth. It is to be thoroughly oiled and then carefully pushed through the anus in a slightly upward direction. Much force must be avoided, for the rectum may be lacerated and serious complications or even death result. Exercise will aid the action of the bowels in this and similar colicky troubles, but severe galloping or trotting is to be avoided. If the horse can have a loose box or paddock, it is the best, as he will then take what exercise he wants. If the patient be extremely violent, it is often wise to restrain him by leading him with a halter, since rupture of the stomach or displacement of the bowels may result and complicate the trouble.

(5) WORM COLIC.—Parasites of many kinds reside in the intestinal canal of horses. There are three kinds of tapeworms, one long roundworm, and several kinds of smaller roundworms. Besides these are the bot-fly grubs. The intestinal worm most commonly seen is the long roundworm, known as *Ascaris equorum.* They are white or reddish in color and measure from 4 to 12 inches in length. In thickness they vary from the size of a rye straw to that of a lady's little finger, being thickest at the middle and tapering at both ends. They are found singly or in groups or masses, and infest chiefly the small intestines.

Symptoms.—Symptoms of intestinal worms are not always observed, even when many parasites are present. If the infestation is extreme, there may be slight colicky pains at times, or there may only be switching of the tail, frequent passages of manure, and some slight straining, itching of the anus, and rubbing of the tail or rump against the stall or fences; the horse is in poor condition; does not shed his coat; is hidebound and potbellied; the appetite is depraved, licking the walls, biting the wooden work of the stalls, licking parts of his body, eating earth, and being particularly fond of salt; the bowels are irregular, constipation or diarrhea being noticed. Some place much dependence upon the symptom of itching of the upper lip, as shown by the horse frequently turning it up and rubbing it upon the wall or stalls. Others again declare that whenever we see the adherence of a dried whitish substance about the anus, worms are present. The one symptom, however, that we should always look for, and certainly the only one that may not deceive us, is seeing the worms or their eggs (by the use of a microscope) in the dung.

Treatment.—Remedies to destroy intestinal worms are much more efficient if given after a long fast, and then the worm medicine must be supplemented by a physic to carry out the worms. Among the best worm medicines may be mentioned turpentine, tartar emetic, creolin, infusion of tobacco, and bitter tonics. To destroy tapeworms, areca nut, malefern, and pumpkin seeds are the best. If a horse is passing the long roundworms, the plan of treatment is to give twice daily for three or four days a drench composed of turpentine or creolin 1 ounce and linseed oil 2 or 3 ounces, to be followed on the fourth day by a physic of Barbados aloes 1 ounce. This dose should not be repeated, and should be followed in six hours by 1 quart of linseed oil. If worms infesting the large bowels are present, injections into the rectum of infusions of tobacco, infusions of quassia chips, one-half pound to a gallon of water, once or twice daily for a few days, and follow by a physic, are most beneficial. It should be borne in mind that intestinal worms are mostly seen in horses that are in poor condition, and an essential part of treatment then is to improve the appetite and powers of digestion. This is best done by giving the vegetable tonics. One-half ounce of Peruvian bark, gentian, ginger, quassia, etc., is to be given twice a day in the feed or as a drench.

To improve the general condition one may give artificial Carlsbad salts, 1 tablespoonful in each feed, and each dose to have added to it 3 to 5 grains of arsenious acid. Bot-fly larvæ do not require special treatment unless they lodge in the rectum, in which case they may be dislodged by injecting tobacco water. If plenty of rock salt is allowed for horses to lick, they will thus be protected against intestinal parasites to a slight but useful degree.

INDIGESTION OR GASTRO-INTESTINAL CATARRH.—There is ample reason for considering these conditions together from the facts that they merge insensibly into each other and usually occur simultaneously. This condition may be acute—that is, of sudden onset—or it may be chronic. The changes of structure produced by this disease occur in the mucous-membrane lining of the stomach and intestines. This membrane becomes red from increased blood supply or from hemorrhage into it, it is swollen, and is covered by a coating of slimy mucus. In some especially severe cases the membrane is destroyed in spots, causing the appearance of ulcers or of erosions.

The causes of indigestion are numerous, but nearly all are the result of errors in feeding.

Some horses are naturaly endowed with weak digestive organs, and such are predisposed to this condition. Anything that irritates the stomach or intestines may cause this disease. Foods that the animal is unaccustomed to, sudden changes of diet, imperfectly cured, unripe, or damaged foods are all fruitful causes, and so are worms. In suckling foals this condition may come from some disease of the dam that renders her milk indigestible or from overexertion or overheating of the mare. Another prolific cause is bad teeth, making mastication imperfect, and thus causing the horse to swallow his food in a condition unfit for the action of the digestive juices. Working a horse too soon or too hard after feeding may cause either colic or indigestion. Any condition that reduces the vitality of the horse, such as disease, overwork, poor food, or lack of care, may indirectly bring on indigestion by weakening the digestive organs.

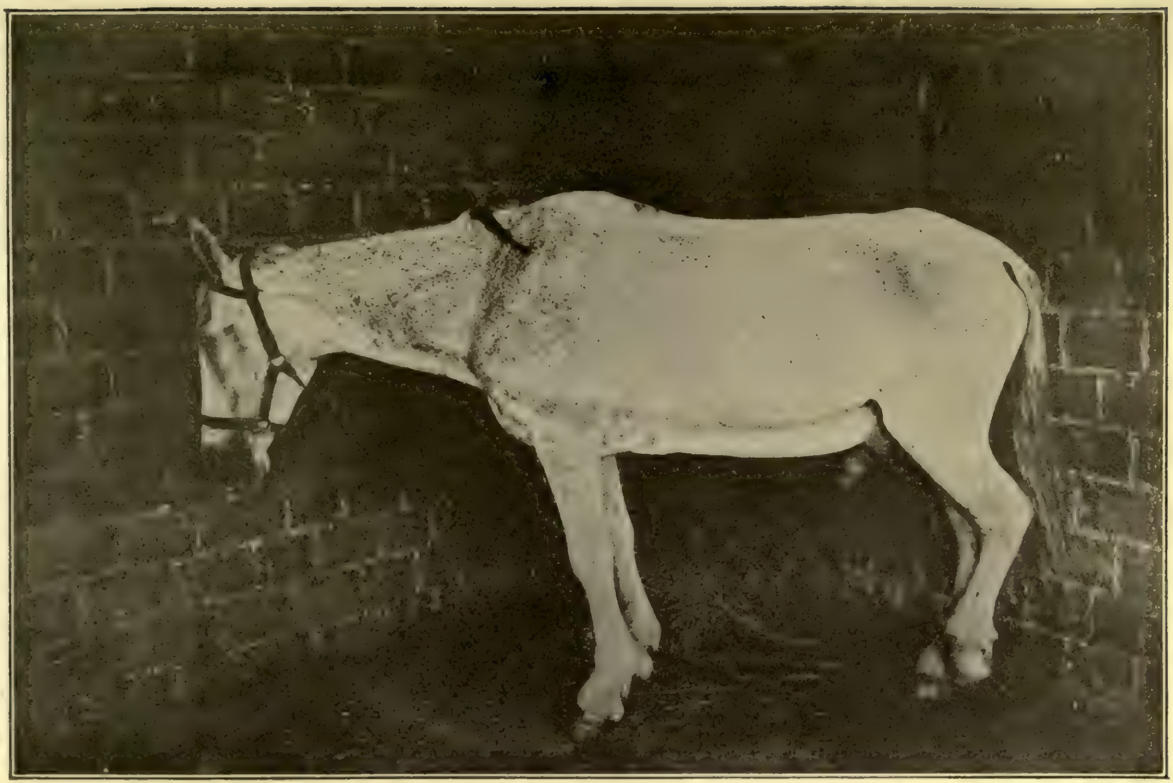
Symptoms.—Indigestion is characterized by irregular appetite; refusing all food at times, and at others eating ravenously; the appetite is not only irregular, but is often depraved; there is a disposition on the part of the horse to eat unusual substances, such as wood, soiled bedding, or even his own feces; the bowels are irregular today, loose and bad smelling, to-morrow bound; grain is often passed whole in the feces, and the hay passed in balls or impacted masses, undergoing but little change; the horse frequently passes considerable quantities of wind that has a sour odor. The animal loses flesh, the skin presents a hard, dry appearance and seems very tight (hide-bound). If the stomach is very seriously involved, the horse may yawn by stretching the head forward and upward and by turning outward the upper lip. There may be more or less colicky pain. In the chronic cases there is mental depression; the horse is sluggish and dull. The abdomen gradually becomes small, giving a tucked up appearance, or, on the other hand, it becomes flaccid and pendulous.

Treatment.—One should commence with the food—its quality, quantity, and time of feeding; examine the water supply, and see, besides, that it is given before feeding; then carefully observe the condition of the mouth and teeth; and, continuing the observations as best we may, endeavor to locate the seat of the trouble. If the teeth are sharp or irregular they must be rasped down; if any are decayed they must be extracted; if indigestion is due to ravenous eating or bolting, the feed must then be given from a large manger where the grain can be spread and the horse thus compelled to eat slowly.

Any irritation, such as worms, undigested food, etc., that is operating as causes are to be removed by appropriate treatment, as advised elsewhere. If there is a tendency to distention of the stomach and bowels, with gas, during indigestion, the following may be used: Baking soda, powdered ginger, and powdered gentian, equal parts. These are to be thoroughly mixed and given in heaping tablespoonful doses, twice a day, before feeding. This powder is best given by dissolving the above quantity in a half pint of water and given as a drench.

As a digestive tonic the following is good: Glauber's salts, 2 pounds; common salt, 1 pound; baking soda, one-half pound. Of this a heaping tablespoonful may be given in each feed. If diarrhea exists, the treatment advised below may be used.

DIARRHEA.—Diarrhea is due to indigestion or intestinal catarrh or to irritation of the bowels from eating moldy or musty food, drinking stagnant water, diseased condition of the teeth, eating irritating substances, to being kept on low, marshy pastures, and ex-



SURRA; 19TH DAY OF DISEASE. DEPT. OF AGR. 1909.

posure during cold nights, or low, damp stables. Some horses are predisposed to scour and are called washy by horsemen; they are those with long bodies, long legs, and narrow, flat sides. Horses of this build are almost sure to scour if fed or watered immediately before being put to work. Fast or road work, of course, aggravates this trouble. Diarrhea may exist as a complication of other diseases as pneumonia and influenza, for instance, and again during the diseases of the liver. The symptoms are the frequent evacuations of liquid stools, with or without pronounced abdominal pain, loss of appetite, emaciation, etc.

Treatment is at times very simple, but requires the utmost care and judgment. If due to faulty food or water it is sufficient to change these. If it results from some irritant in the intestines, this is best gotten rid of by the administration of a purge, for which nothing is better than castor oil, although raw linseed oil may be used if the case is not severe. The diarrhea often disappears with the cessation of the operation of the medicine. If, however, purging continues, it may be checked by giving wheat flour in water, starch water, white-oak bark tea, chalk, opium, or half-dram doses of sulphuric acid in one-half pint of water twice or thrice daily. Good results follow the use of powdered opium 2 drams and subnitrate of bismuth 1 ounce, repeated three times a day. It should be remembered in all cases to look to the water and feed the horse is receiving. If either of these is at fault it is at once to be discontinued. We should feed sparingly of good, easily digested foods. With that peculiar build of nervous horses that scour on the road but little can be done, as a rule. They should be watered and fed as long as possible before going on a drive. If there is much flatulency accompanying diarrhea, baking soda may effect a cure, while if the discharges have a very disagreeable odor, this can be corrected by 1 ounce of sulphite of soda or dram doses of creolin in water, repeated twice a day. Be slow to resort to either the vegetable or mineral astringents, since the majority of cases will yield to change of food and water or the administration of oils. Afterwards feed upon wheat-flour gruel or other light foods. The body should be warmly clothed.

SUPERPURGATION.—This is the designation of that diarrhea, or flux from the bowels, that, at times, is induced by and follows the action of a physic. It is accompanied by much irritation or even inflammation of the bowels and is always of a serious character. Although in rare instances it follows from a usual dose of physic and where every precaution has been taken, it is most likely to result under the following circumstances: Too large a dose of physic; giving physics to horses suffering from pneumonia, influenza, or other debilitating diseases; riding or driving a horse when purging; exposure or drafts of cold air; or giving large quantities of cold water while the physic is operating. There is always danger of superpurgation if a physic is given to a horse suffering from diseases of the respiratory organs. Small and often-repeated physics are also to be avoided, as they produce debility and great depression of the system and predispose to this disorder. When a physic is to be given one should rest the horse and give him sloppy food until the medicine begins to operate; clothe the body with a warm blanket; keep out of drafts; give only warm water in small quantities. After a horse has purged from twelve to twenty-four hours it can mostly be stopped, or set, as horsemen say, by feeding on dry oats and hay. Should the purging continue, however, it is best treated by giving linseed tea and oatmeal or wheat-flour gruel. After this the astringents spoken of for diarrhea may be given. Besides this the horse is to receive brandy in doses of from 2 to 4 ounces, with milk and eggs, four or five times a day.

DYSENTERY.—This disease, sometimes called bloody flux, is an intestinal disease attended with fever, occasional abdominal pains, and fluid discharges mingled with blood. Discharges in dysentery are coffee colored or bloody, liquid, and very offensive in odor, and passed with much straining. It is rare in the horse, but is sometimes quite prevalent among foals.

Causes.—Probably the most common cause is keeping young horses in particular for a long time on low, wet, marshy pastures, without other feed (a diarrhea of long standing sometimes terminates in dysentery); exposure during cold, wet weather; decomposed foods; stagnant water that contains large quantities of decomposing vegetable matter; low, damp, and dark stables, particularly if crowded; the existence of some disease, as tuberculosis of the abdominal form. In suckling foals it may come from feeding the dam on irritant foods or from disease of the udder. In other foals it may be produced by exposure to cold and damp, to irritant food, or to worms.

Symptoms.—The initial symptom is a chill, which probably escapes notice in the majority of instances. The discharges are offensive and for the most part liquid, although it is common to find lumps of solid fecal matter floating in this liquid portion; shreds of mucous membrane and blood may be passed, or the evacuations may be muco-purulent; there is much straining, and, rarely, symptoms of abdominal pain; the subject lies down a great deal; the pulse is quickened and the temperature elevated. Thirst is a prominent symptom. In the adult, death rarely follows under two or three weeks, but in foals the disease may end in death after a few days.

Treatment.—This is most unsatisfactory, and more dependence should be placed upon the care and feed than any medication that may be adopted. First of all the horse must be placed in a dry, warm, yet well-ventilated stable; the skin is to receive attention by frequent rubbings of the surface of the body, with blankets, and bandages to the legs. The water must be pure and given in small quantities; the food, that which is light and easily digested. Medicinally, give at first a light dose of castor oil, about one-half pint, to which has been added 2 ounces of laudanum. The vegetable or mineral astringents are also to be given. Starch injections containing laudanum often afford great relief. The strength must be kept up by milk punches, eggs, beef tea, oatmeal gruel, etc. In spite of the best care and treatment, however, dysentery is likely to prove fatal. In the case of nurslings, the dam should be placed in a healthy condition or, failing in this, milk should be had from another mare or from a cow.

GASTRO-ENTERITIS.—This condition consists in an inflammation of the stomach and intestines. Instead of being confined to the mucous, or lining, membrane, as in gastro-intestinal catarrh, the inflammatory process extends deeper and may even involve the entire thickness of the wall of the organ. This disease may be caused by irritant food, hot drinks, sudden chilling, moldy or decayed foods, foul water, parasites, or by chemical poisons. It may also complicate some general diseases, especially infectious diseases, as anthrax, influenza or rabies. Long-continued obstruction of the bowels or displacement resulting in death are preceded by enteritis.

The symptoms differ somewhat with the cause and depend also, to some extent, upon the chief location of the inflammation. In general the animal stops eating or eats but little; it shows colicky pain; fever develops; the pulse and respiration become rapid; the mucous membrane becomes red; the mouth is hot and dry. Pressure upon the abdomen may cause pain. Intestinal sounds can not be heard at the flank. There is constipation in the earlier stages that is followed later by diarrhea. The extremities become cold. Sometimes the feces are coated with or contain shreds of fibrin, looking like scraps of dead membrane, and they have an evil, putrid odor. If the disease is caused by moldy or damaged food there may be great muscular weakness with partial paralysis of the throat, as shown by inability to swallow. If chemical poisons are the cause, this fact may be shown by the sudden onset of the disease, the history of the administration of a poison or the entire absence of known cause, the rapid development of threatening symptoms, the involvement of a series of animals in the absence of a contagious disease, and the special symptoms and alterations known to be produced by certain poisons. To make this chain of evidence complete, the poison may be discovered in the organs of the horse by chemical analysis. In nearly all cases of gastro-enteritis there is nervous depression.

The poisons that are most irritant to the digestive tract are arsenic, corrosive sublimate, sugar of lead, sulphate of copper, sulphate or chloride of zinc, lye or other strong alkalies, mineral acids, and, among the vegetable poisons, tobacco, lobelia, and water hemlock.

The treatment will depend upon the cause, but if this can not be detected, certain general indications may be observed. In all cases food should be given in small amounts and should be of the most soothing description, as oatmeal gruel, flaxseed tea, hay tea, fresh grass, or rice water. The skin should be well rubbed with wisps of straw and alcohol, to equalize the distribution of the blood; the legs, after being rubbed until warm, should be bandaged in raw cotton or with woolen bandages. The horse should be warmly blanketed. It is well to apply to the abdomen blankets wrung out of hot water and frequently changed; or mustard paste may be rubbed on the skin of the belly. Internally, opium is of service to allay pain, check secretion, and soothe the inflamed membrane. The dose is from 1 to 2 drams, given every three or four hours. If there is constipation, the opium should be mixed with 30 grains of calomel. Stimulants, such as alcohol, aromatic spirits of ammonia, or camphor may be given in 2-ounce doses, mixed with warm water to make a drench.

If putrid food has been consumed, creolin may be administered in doses of 2 drams, mixed with 1 pint of warm water or milk. If there is obstinate constipation and a laxative must be employed, it should be sweet or castor oil, from 1 pint to 1 quart. For the various poisons the remedies are as follows: Arsenic, oxyhydrate of iron solution, 1 pint to 1 quart, or calcined magnesia one-half ounce in 1 pint of water; corrosive sublimate, the whites of a dozen eggs or 2 ounces of flowers of sulphur; sugar of lead, Glauber's salts, 1 pound in 1 quart of warm water, to be followed with iodide of potash, 3 drams at a dose, in water, three times daily for five days; sulphate of copper, milk, the whites of eggs, or reduced iron; sulphate of chloride of zinc, milk, the whites of eggs, or calcined magnesia; lye or alkalies, as caustic potash or soda, vinegar, dilute sulphuric acid, and linseed tea, with opium, 3 drams; mineral acids, chalk, or calcined magnesia, or baking soda; later give linseed tea and opium.

Hemorrhoids, or Piles.—These are rare, comparatively, in horses. They are diagnosed by the appearance of bright-red irregular tumors after defecation, which may remain visible at all times or be seen only when the horse is down or after passing his manure. They are mostly due to constipation, to irritation, or injuries, or follow from the severe straining during dysentery.

Treatment.—Attention must be paid to the condition of the bowels; they should be soft, but purging is to be avoided. The tumors should be washed in warm water and thoroughly cleansed, after which scarify them and gently but firmly squeeze out the liquid that will be seen to follow the shallow incisions. After thus squeezing these tumors and before replacing through the anus, bathe the parts with some anodyne wash. For this purpose the glycerite of tannin and laudanum in equal parts is good.

Hernia, or Rupture.—There are several different kinds of hernias that require notice, not all of which, however, produce serious symptoms or results. Abdominal hernias, or ruptures, are divided into reducible, irreducible, and strangulated, according to condition; and into inguinal, scrotal, ventral, umbilical, and diaphragmatic, according to their situation. A hernia is reducible when the displaced organ can be returned to its natural location. It consists of a soft swelling, without heat, pain, or any uneasiness, generally larger on full feed, and decreases in size as the bowels become empty. An irreducible hernia is one that can not be returned into the abdomen, and yet does not cause any pain or uneasiness. Strangulated hernia is one where the contents of the sac are greatly distended, or where from pressure upon the blood vessels of the imprisoned portion the venous circulation is checked or stopped, thereby causing congestion, swelling, inflammation, and, if not relieved, gangrene of the part and death of the animal. According to the time or mode of origin, hernias may be congenital or acquired.

Congenital Scrotal Hernia.—Not a few foals are noticed from birth to have an enlarged scrotum, which gradually increases in size until about the sixth month, sometimes longer. Sometimes the scrotum of a six-months-old colt is as large as that of an adult stallion, and operative treatment is considered. This is unnecessary in the great majority of cases, as this enlargement often disappears by the time the colt has reached his second year. Any interference, medicinal or surgical, is worse than useless. If the intestine contained within the scrotum should at any time become strangulated, it must then be treated the same as in an adult horse.

Scrotal hernia is caused by dilatation of the sheath of the testicle, combined with relaxation of the fibrous tissues surrounding the inguinal ring, thus allowing the intestine to descend to the scrotum. At first this is intermittent, appearing during work and returning when the horse is at rest. For a long time this form of hernia may not cause the least uneasiness or distress. In course of time, however, the imprisoned gut becomes filled with feces, its return into the abdominal cavity is prevented, and becomes strangulated. While the gut is thus filling the horse often appears dull, is disinclined to move, appetite is impaired, and there is rumbling and obstruction of the bowels. Colicky symptoms now supervene. Strangulation and its consequent train of symptoms do not always follow in scrotal hernia, for often horses have this condition without suffering inconvenience for years.

Inguinal hernia is but an incomplete scrotal hernia, and, like the latter, may exist and cause no signs of distress, or, again, it may become strangulated and cause the death of the animal. Inguinal hernia is seen mostly in stallions, next in geldings, and very rarely in the mare. Bearing in mind that *scrotal hernia* is seen only in entire horses, we can proceed to detail the *symptoms* of both strangulated, inguinal, and scrotal hernia at the same time. When, during the existence of colicky symptoms, we find a horse kicking with his hind feet while standing or lying upon his back, we should look to the inguinal region and scrotum. If scrotal hernia exists the scrotum will be enlarged; by pressure we may force a portion of the contents of the gut back into the abdomen. If we take a gentle but firm hold upon the enlarged scrotum and then have an assistant cause the horse to cough, the swelling will be felt to *expand* and as quickly *contract* again.

The history of these cases will materially aid us, as the owner can often assure us of preceding attacks of colic, more or less severe, that have been instantaneously relieved in some unaccountable manner. The colicky symptoms of these hernias are not *diagnostic,* but, probaby, more closely resemble those of enteritis than any other bowel diseases. The diagnosis can, in many cases, be made only by a veterinarian, when he has recourse to a rectal examination; the bowels can here be felt entering the internal abdominal ring.

Treatment of Inguinal Hernia.—If the reader can be sure of the existence of hernia, he should secure the horse upon its back, and, with a hand in the rectum, endeavor to catch hold of the wandering bowel and pull it gently back into the cavity of the abdomen. Pressure should be made upon the scrotum during this time. If these means fail a veterinarian must be called to reduce the hernia by means of incising the inguinal ring, replacing the intestines, and castrate, using clamps and performing the covered operation.

Ventral Hernia.—In this form of hernia the protrusion is through some accidental opening or rupture of the abdominal wall. It may occur at any part of the belly except at the umbilicus, and is caused by kicks, blows, hooks, severe jumping or pulling, etc. Ventral hernia is most common in pregnant mares, and is here due to the weight of the fetus or some degenerative changes taking place in the abdominal coats. It is recognized by the appearance of a swelling, at the base of which can be felt the opening or rent in the abdominal tunics, and from the fact that the swelling containing the intestines can be made to disappear when the animal is placed in a favorable position.

Treatment of Ventral Hernia.—In many instances there is no occasion for treatment, and again, where the hernial sac is extensive, treatment is of no avail. If the hernia is small, a cure may be attempted by the methods to be described in treating of umbilical hernia. If one is fortunate enough to be present when the hernia occurs, and particularly if it is not too large, he may, by the proper application of a pad and broad bandage, effect a perfect cure.

Umbilical Hernia is the passing of any portion of the bowel or omentum through the navel, forming a tumor at this point. This is often congenital in our animals, and is due to the imperfect closure of the umbilicus and to the position of the body. Many cases of umbilical hernia, like inguinal and scrotal of the congenital kind, disappear entirely by the time the animal reaches its second or third year. Advancing age favors cure in these cases from the fact that the swinging support of the bowels is proportionally shorter in adults than in foals, thus lifting the intestines out of the hernial sac and allowing the opening in the walls to close. Probably one of the most frequent causes of umbilical hernia in foals is the practice of keeping them too long from their dams, causing them to fret and worry, and to neigh, or cry, by the hour. The contraction of the abdominal muscles and pressure of the intestines during neighing seem to open the umbilicus and induce hernia. Accidents may cause umbilical hernia in adults in the same manner as ventral hernia is produced, though this is very rare.

Treatment of Umbilical Hernia.—In the treatment of umbilical hernia it should be remembered that congenital hernias are often removed with age, but probably congenital umbilical hernias less frequently than others. Among the many plans of treatment are to be mentioned the application of a pad over the tumor, the pad being held in place by a broad tight bandage placed around the animal's body. The chief objection to this is the difficulty in keeping the pad in its place. Blisters are often applied over the swelling, and, as the skin hardens and contracts by the formation of scabs, an artificial bandage or pressure is produced that at times is successful. Another treatment that has gained considerable repute of late years consists in first clipping off the hair over the swelling. Nitric acid is then applied by a small brush, using only enough to moisten the skin. This sets up a deep-seated adhesive inflammation, which, in very many cases, closes the opening in the navel.

Others, again, after keeping the animal fasting for a few hours, cast and secure it upon its back; the bowel is then carefully returned into the abdomen. The skin over the opening is pinched up and one or two skewers are run through the skin from side to side as close as possible to the umbilical opening. These skewers are kept in place by passing a cord around the skin between them and the abdomen and securely tied. Great care must be taken not to draw these cords too tight, as this would cause a speedy slough of the skin, the intestines would extrude, and death result. If properly applied, an adhesion is established between the skin and the umbilicus which effectually closes the orifice. Special clamps are provided for taking up the fold of the skin covering the hernial sac and holding it until the adhesion is formed.

Diaphragmatic Hernia.—This consists of the passage of any of the abdominal viscera through a rent in the diaphragm into the cavity of the thorax. It is rather a rare accident and one often impossible to diagnose during life. Colicky symptoms, accompanied by great difficulty in breathing, and the peculiar position so often assumed (that of sitting upon the haunches) are somewhat characteristic of this trouble, though these symptoms, as we have already seen, may be present during diseases of the stomach or anterior portion of the bowels. Even could we pronounce, with certainty, this form of hernia, there is little or nothing that can be done. Leading the horse up a very steep gangway or causing him to rear up may possibly cause the hernial portion to return to its natural position. This is not enough, however; it must be kept there.

PERITONITIS.—Peritonitis is an inflammation of the serous membrane lining the cavity of and covering the viscera contained within the abdomen. It is very rare to see a case of primary peritonitis. It is, however, somewhat common as a secondary disease from extension of the inflammatory action involving organs covered by the peritoneum. Peritonitis is often caused by injuries, as punctured wounds of the abdomen, severe blows or kicks, or, as is still more common, following the operation of castration. It follows strangulated hernia, invagination, or rupture of the stomach, intestines, liver, or womb.

Symptoms.—Peritonitis is mostly preceded by a chill; the horse is not disposed to move, and, if compelled to do so, moves with a stiff or sore gait; he paws with the front feet and may strike at his belly with the hind ones; lies down very carefully; as the pain is increased while down, he maintains during most of the time the standing position; he walks uneasily about the stall. Constipation is usually present. Pressure on the belly causes acute pain, and the horse will bite, strike, or kick if so disturbed; the abdomen is tucked up; the extremities are fine and cold. The temperature is higher than normal, reaching from 102° to 104° F. The pulse in peritonitis is rather characteristic; it is quickened, beating from seventy to ninety beats per minute, and it is hard and wiry. This peculiarity of the pulse occurs in inflammation of the serous membrane, and if accompanied by colicky symptoms, and, in particular, if following any injuries, accidental or surgical, of the peritoneum, there is reason to think that peritonitis is present. Peritonitis in the horse is mostly fatal when it is at all extensive. If death does not occur in a short time, the inflammation assumes a chronic form, in which there is an extensive effusion of water in the cavity of the belly, which, as a rule, results in death.

The treatment of peritonitis is to be somewhat like that of enteritis. Opium in powder, 1 to 2 drams, with calomel, one-half dram, is to be given every two, three, or four hours, and constitutes the main dependence in this disease. Extensive counterirritants over the belly, consisting of mustard plasters, applications of mercurial ointment, turpentine stupes, or even mild blisters, are recommended. Purgatives must never be given during this complaint. Should we desire to move the bowels, it can be done by gentle enemas, though it is seldom necessary to resort even to this.

ASCITES, OR DROPSY OF THE ABDOMEN.—This is seen as a result of subacute or chronic peritonitis, but may be due to diseases of the liver, kidneys, heart, or lungs. There will be found, on opening the cavity of the belly, a large collection of yellowish or reddish liquid; from a few quarts to several gallons may be present. It may be clear in color, though generally it is yellowish or of a red tint.

Symptoms.—There is slight tenderness on pressure; awkward gait of the hind legs; the horse is dull, and may have occasional very slight colicky pains, shown by looking back and striking at the belly with the hind feet. Oftener, however, these colicky symptoms are absent. Diarrhea often precedes death, but during the progress of the disease the bowels are alternately constipated and loose. On percussing the abdominal walls we find that dullness exists to the same height on both sides of the belly; by suddenly pushing or striking the abdomen we can hear the rushing or flooding of water. If the case is an advanced one, the horse is potbellied to the extreme, and dropsical swellings are seen under the belly and upon the legs.

Treatment is, as a rule, unsatisfactory. Saline cathartics, as Epsom or Glauber's salts, and diuretics, ounce doses of saltpeter, may be given. If a veterinarian is at hand he will withdraw the accumulation of water by tapping and then endeavor to prevent its recurrence (though this is almost sure to follow) by giving three times a day saltpeter, 1 ounce, and iodide of potash, 1 dram, and by the application of mustard or blisters over the abdominal walls. Tonics, mineral and vegetable, are also indicated. Probably the best tonic is one consisting of powdered sulphate of iron, gentian, and ginger in equal parts; a heaping tablespoonful of the mixture is given as a drench or mixed with the feed, twice a day. Good nutritious foods and gentle exercise complete the treatment.

DISEASES OF THE LIVER.

The liver of the horse is, in the United States, but rarely the seat of disease, and when we consider how frequently the liver of man is affected this can not but appear strange. The absence of the gall bladder may account to a certain extent for his freedom from liver diseases; as overdistention of this and the presence in it of calculi (stones) in man is a frequent source of trouble. In domestic animals, as in man, hot climates tend to produce diseases of the liver, just as in cold climates lung diseases prevail. Not only are diseases of the liver rare in horses in temperate climates, but they are also very obscure, and in many cases pass totally unobserved until after death. There are some symptoms, however, which, when present, should make us examine the liver as carefully as possible. These are jaundice (yellowness of the mucous membranes of the mouth, nose, and eyes) and the condition of the dung, it being light in color and pasty in appearance.

HEPATITIS, OR INFLAMMATION OF THE LIVER.—This disease may be general or local, and may assume an acute or chronic form. The symptoms of acute hepatitis are: Dullness; the horse is suffering from some internal pain, but not of a severe type; constipated and clay-colored dung balls; scanty and high-colored urine; and general febrile symptoms. If lying down, he is mostly found on the left side; looks occasionally toward the right side, which, upon close inspection, may be found to be slightly enlarged over the posterior ribs, where pain upon pressure is also evinced. Obscure lameness in front, of the right leg mostly, may be a symptom of hepatitis. The horse, toward the last, reels or staggers in his gait and falls backward in a fainting fit, during one of which he finally succumbs. Death is sometimes due to rupture of the enveloping coat of the liver or of some of its blood vessels.

Causes.—Among the causes that lead to this disease we must mention first the stimulating effect of overfeeding, particularly during hot weather. Horses that are well fed and receive but little exercise are the best subjects for disease of this organ. We must add to these causes the more mechanical ones, as injuries on the right side over the liver, worms in the liver, foreign bodies—as needles or nails that have been swallowed and in their wanderings have entered the liver—and, lastly, in some instances, the extension of inflammation from neighboring parts, thus involving this organ. Acute hepatitis may terminate in chronic inflammation, abscesses, rupture of the liver, or may disappear, leaving behind no trace of disease whatever.

Treatment.—This should consist, at first, of the administration of 1 ounce of Barbados aloes or other physic. General blood-letting, if had recourse to early, must prove of much benefit in acute inflammation of the liver. The vein in the neck (jugular) must be opened, and from 4 to 6 quarts of blood may be drawn. Saline medicines, as Glauber's salts or the artificial Carlsbad salt, is indicated. These may be given with the feed in tablespoonful doses. The horse is to be fed sparingly on soft food, bran mashes chiefly. If treatment proves successful and recovery takes place, see to it that the horse afterwards gets regular exercise and that his food is not of a too highly nutritious character and not excessive.

JAUNDICE, ICTERUS, OR THE YELLOWS.—This is a condition caused by the retention and absorption of bile into the blood. It was formerly considered to be a disease of itself, but is now regarded as a symptom of disorder of the liver. The yellows is observed by looking at the eyes, nose, and mouth, when it will be seen that these parts are yellowish instead of the pale-pink color of health. In white or light-colored horses the skin even may show this yellow tint. The urine is saffron colored, the dung is of a dirty-gray color, and constipation is usually present. Jaundice may be present as a symptom of almost any inflammatory disease. We know that when an animal has fever the secretions are checked, the bile may be retained and absorbed throughout the system, and yellowness of the mucous membranes follows. Jaundice may also exist during the presence of simple constipation, hepatitis, abscesses, hardening of the liver, etc.

Treatment.—When jaundice exists we must endeavor to rid the system of the excess of bile, and this is best accomplished by giving purgatives that act upon the liver. Calomel, 2 drams, with aloes, 7 drams, should be given. Glauber's salts in handful doses once or twice a day for a week is also effective. May apple, rhubarb, castor oil, and other cathartics that act upon the first or small bowels may be selected. We must be careful to see that the bowels are kept open by avoiding hard, dry, bulky foods.

RUPTURE OF THE LIVER.—This is known to occur at times in the horse, most frequently in old fat horses and those that get but little exercise. Horses that have suffered from chronic liver disease for years eventually present symptoms of colic and die quite suddenly. Upon post-mortem examination we discover that the liver had ruptured. The scars that are often found upon the liver indicate that this organ may suffer *small* rupture and yet the horse recover from it. This result can not obtain, however, if the rent or tear is extensive, since in such cases death must quickly follow from hemorrhage, or, later, from peritonitis. Enlarged liver is particularly liable to rupture.

Causes.—The immediate causes of rupture appear to be excessive muscular exertion, as leaping a fence, a fall, a blow from a collision, a kick from a horse, or sudden distention of the abdomen with gas.

The *symptoms* of rupture of the liver will depend upon the extent of the laceration. If slight, there will be simply the symptoms of abdominal pain, looking back to the sides, lying down, etc.; if extensive, the horse is dull and dejected, has no appetite, breathing becomes short and catching, he sighs or sobs, visible mucous membranes are pale, extremities cold, pulse fast, small, and weak or running down. Countenance now shows much distress, he sweats profusely, totters in his gait, props his legs wide apart, reels, staggers, and falls. He may get up again, but soon falls dead. The rapid running-down pulse, paleness of the eyes, nose, and mouth, sighing, tottering gait, etc., are symptoms by which we know that the animal is dying from internal hemorrhage.

Treatment.—But little can be done in the way of treatment. Opium in powder, in doses of 2 drams every two or three hours, may be given, with the idea of preventing as much as possible all movements of internal organs. If there is reason to suspect internal bleeding, we should give large and frequent doses of white-oak bark tea, dram doses of tannic or gallic acid, or the same quantity of sugar of lead, every half hour or hour. Fluid extract of ergot or tincture of the chloride of iron, in ounce doses, may be selected. Cold water dashed upon the right side or injected into the rectum is highly spoken of as a means of checking the hemorrhage.—(Spl. Rpt. Horse, Dept. Ag. 1911; Va. E. S. B. 115, 116, 117, 119, 120; Ark. E. S. B. 25; S. C. E. S. B. 22.)

DISEASES AFFECTING THE RESPIRATORY SYSTEM.

The organs pertaining to the respiratory function may be enumerated in natural order as follows: The nasal openings, or nostrils; the nasal chambers, through which the air passes in the head; the sinuses in the head, communicating with the nasal chambers; the pharynx, common to the functions of breathing and swallowing; the larynx, at the top of the windpipe; the trachea, or windpipe; the bronchi (into which the windpipe divides), two tubes leading from the windpipe to the right and left lungs, respectively; the bronchial tubes, which penetrate and convey air to all parts of the lungs; the lungs.

The pleura is a thin membrane that envelops the lung and lines the walls of the thoracic cavity. The diaphragm is a muscular structure, completely separating the contents of the thoracic cavity from those of the abdominal cavity. It is essentially a muscle of inspiration, and the principal one. Other muscles aid in the mechanism of respiration, but the diseases or injuries of them have nothing to do with the diseases under consideration.

Just within the nasal openings the skin becomes gradually but perceptibly finer, until it is succeeded by the mucus membrane. Near the junction of the skin and membrane is a small hole, presenting the appearance of having been made with a punch; this is the canal that conveys the tears from the eyes. Within and above the nasal openings are the cavities, or fissures, called the false nostrils. The nasal chambers are completely separated, the right from the left, by a cartilaginous partition, the nasal septum. Each nasal chamber is divided into three continuous compartments by two thin, scroll like turbinated bones.

The mucous membrane lining the nasal chambers, and in fact the entire respiratory tract, is much more delicate and more frequently diseased than the mucous membrane of any other part of the body. The sinuses of the head are compartments which communicate with the nasal chambers and are lined with a continuation of the same membrane that lines the nasal chambers; their presence increases the volume and modifies the form of the head without increasing its weight. The horse, in a normal condition, breathes exclusively through the nostrils. The organs of respiration are more liable to disease than the organs connected with any other function of the animal, and, as many of the causes can be avoided, it is both important and profitable to know and study the causes.

CAUSES OF DISEASES OF RESPIRATORY ORGANS.

The causes of many of the diseases of these organs may be given under a common head, because even a simple cold, if neglected or badly treated, may run into the most complicated lung disease and terminate fatally. In the spring and fall, when the animals are changing their coats, there is a marked predisposition to contract disease, and consequently care should be taken at those periods to prevent other exciting causes.

Badly ventilated stables are a frequent source of disease. It is a mistake to think that country stables necessarily have purer air than city stables. Stables on some farms are so faultily constructed that it is almost impossible for the foul air to gain an exit. All stables should have a sufficient supply of pure air, and be so arranged that strong drafts can not blow directly on the animals. In ventilating a stable, it is best to arrange to remove air from near the floor and admit it through numerous small openings near the ceiling. The reason for this is that the coldest and most impure air in the stable is near the floor while that which is warmest and purest, and therefore can least be spared is near the top of the room. In summer, top exits and cross currents should be provided to remove excessive heat. Hot stables are almost always poorly ventilated, and the hot stable is a cause of disease on account of the extreme change of temperature that a horse is liable to when taken out, and extreme changes of temperature are to be avoided as certain causes of disease.

A cold, close stable is invariably damp, and is to be avoided as much as the hot, close, and foul stable. Horses changed from a cold to a warm stable are more liable to contract cold than when changed from a warm to a cold stable. Pure air is more essential than warmth, and this fact should be especially remembered when the stable is made close and foul to gain the warmth. It is more economical to keep the horse warm with blankets than to prevent the ingress of pure air in order to make the stable warm.

Stables should be well drained and kept clean. Some farmers allow large quantities of manure to accumulate in the stable. This is a pernicious practice, as the decomposing organic matter evolves gases that are predisposing or exciting causes of disease. When a horse is overheated, it is not safe to allow him to dry by evaporation; rubbing him dry and gradually cooling him out is the wisest treatment. When a horse is hot—covered with sweat—it is dangerous to allow him to stand in a draft; it is the best plan to walk him until his temperature moderates. In such cases a light blanket thrown over the animal may prevent a cold. Overwork or over-exertion often causes the most fatal cases of congestion of the lungs. Avoid prolonged or fast work when the horse is out of condition or unaccustomed to it. Animals that have been working out in cold rains should be dried and cooled out and not left to dry by evaporation. When the temperature of the weather is at the extreme, either of heat or cold, diseases of the organs of respiration are most frequent.

It is not to be supposed that farmers can give their horses the particular attention given to valuable racing and pleasure horses, but they can most assuredly give them common-sense care, and this will often save the life of a valuable animal. If the owner properly considers his interests, he will study the welfare of his horses so that he may be able to instruct the servant in details of stable management.

WOUNDS ABOUT THE NOSTRILS.

Wounds in this neighborhood are common, and are generally caused by snagging on a nail or splinter or by the bite of another horse; or by getting run into, or by running against something. Occasionally the nostril is so badly torn and lacerated that it is impossible to effect a cure without leaving the animal blemished for life, but in the majority of instances the blemish, or scar, is due to the want of conservative treatment. As soon as possible after the accident the parts should be brought together and held there by stitches. If too much time is allowed to elapse, the swelling of the parts will considerably interfere. Never cut away any skin that may be loose and hanging, or else a scar will certainly remain. Bring the parts in direct apposition and place the stitches from a quarter to a half inch apart, as circumstances may demand. It is not necessary to have special surgeons' silk and needles for this operation; good linen thread or ordinary silk thread will answer. The wound afterwards only requires to be kept clean. For this purpose it should be cleansed and discharges washed away daily with a solution made of carbolic acid 1 part, in water 40 parts. If the horse is inclined to rub the wound against some object on account of the irritability, his head should be tied by means of two halter ropes attached to the opposite sides of the stall to prevent him rubbing the wound open. The head should be so tied about ten days, except when at work or eating.

TUMORS WITHIN THE NOSTRILS.

A small globular tumor is sometimes found within the false nostril, under that part of the skin that is seen to puff or rise and fall when a horse is exerted and breathing hard. These tumors contain matter of a cheesy consistency.

Treatment.—If the tumor is well opened and the matter squeezed out, nature will perform a cure. If the opening is made from the outside through the skin, it should be at the most dependent part, but much the best way to open the tumor is from the inside. Quiet the animal, gently insert your finger up in the direction of the tumor, and you will soon discover that it is much larger inside than it appears to be on the outside. If necessary put a twitch on the ear of the horse to quiet him; run the index finger of your left hand against the tumor; now, with the right hand, carefully insert the knife by running the back of the blade along the index finger of the left hand until the tumor is reached; with the left index finger guide the point of the blade quickly and surely into the tumor; make the opening large. A little blood may flow for a while, but it is of no consequence. Squeeze out the matter and keep the part clean.

COLD IN THE HEAD, OR NASAL CATARRH.

Catarrh is an inflammation of a mucous membrane. It is accompanied by excessive secretion. In nasal catarrh the inflammation may extend from the membrane lining the nose to the throat, and to the eyes. The causes are the general causes of respiratory disease enumerated above. It is especially common in young horses and in horses not acclimated.

Symptoms.—The membrane at the beginning of the attack is dry, congested, and irritable; it is of a deeper hue than natural pinkish red or red. Soon a watery discharge from the nostrils makes its appearance; the eyes may also be more or less affected and tears flow over the cheeks. The animal has some fever, which may be easily detected by means of a thermometer inserted in the rectum or, roughly, by placing the finger in the mouth, as the feeling of the heat conveyed to the finger will be greater than natural.

To become somewhat expert in ascertaining the changes of temperature in the horse it is only necessary to place the finger often in the mouths of horses known to be healthy. After you have become accustomed to the warmth of the mouth of the healthy animal you will have no difficulty in detecting a marked increase of the temperature. The animal may be dull; he sneezes or snorts, but does not cough unless the throat is affected; he expels the air forcibly through his nostrils, very often in a manner that may be aptly called blowing his nose. A few days after the attack begins the discharge from the nostrils changes from a watery to that of a thick, mucilaginous state, of a yellowish white color. Often the appetite is lost and the animal becomes debilitated.

Treatment.—This disease is not serious but inasmuch as neglect or bad treatment may cause it to lead to something worse or become chronic, it should receive proper attention. The animal should not be worked for a time. A few days of quiet rest, with pure air and good food, will be of greater benefit than most medication. The value of pure air can not be overestimated, but drafts must be avoided. The benefit derived from the inhalation of steam is considerable. This is effected by holding the horse's head over a bucketful of boiling water, so that the animal will be compelled to inhale steam with every inhalation of air. Stirring the hot water with a wisp of hay causes the steam to arise in greater abundance. One may cause the horse to put his nose in a bag containing cut hay upon which hot water has been poured, the bottom of the bag being stood in a bucket, but the bag must be of loose texture, as gunny sack, or, if of canvas, holes must be cut in the side to admit fresh air.

The horse may be made to inhale steam four or five times a day, about fifteen to twenty minutes each time. Particular attention should be paid to the diet. Give bran mashes, scalded oats, linseed gruel, and grass, if in season. If the horse evinces no desire for this soft diet, it is better to allow any kind of food he will eat, such as hay, oats, corn, etc., than to keep him on short rations. If the animal is constipated, relieve this symptom by injections of warm water into the rectum three or four times a day, but do not administer purgative medicines, excepting of a mild character.

For simple cases the foregoing is all that is required, but if the appetite is lost and the animal appears debilitated and dull, give 3 ounces of the solution of acetate of ammonia and 2 drams of powdered chlorate of potassium diluted with a pint of water three times a day as a drench. Be careful when giving the drench; do not pound the horse on the gullet to make him swallow; be patient, and take time, and do it right. If the weather be cold, blanket the animal and keep him in a comfortable stall. If the throat is sore, treat as advised for that ailment, to be described hereafter. If, after ten days or two weeks, the discharge from the nostrils continues, give one-half dram of reduced iron three times a day. This may be mixed with damp feed. Common cold should be thoroughly understood and intelligently treated in order to prevent more dangerous diseases.

CHRONIC CATARRH (OR NASAL GLEET).

This is a subacute or chronic inflammation of some part of the membrane affected in common cold, the disease just described. It is manifested by a persistent discharge of a thick white or yellowish white matter from one or both nostrils. The commonest cause is a neglected or badly treated cold, and it usually follows those cases where the horse has suffered exposure, been overworked, or has not received proper food, and, as a consequence, has become debilitated.

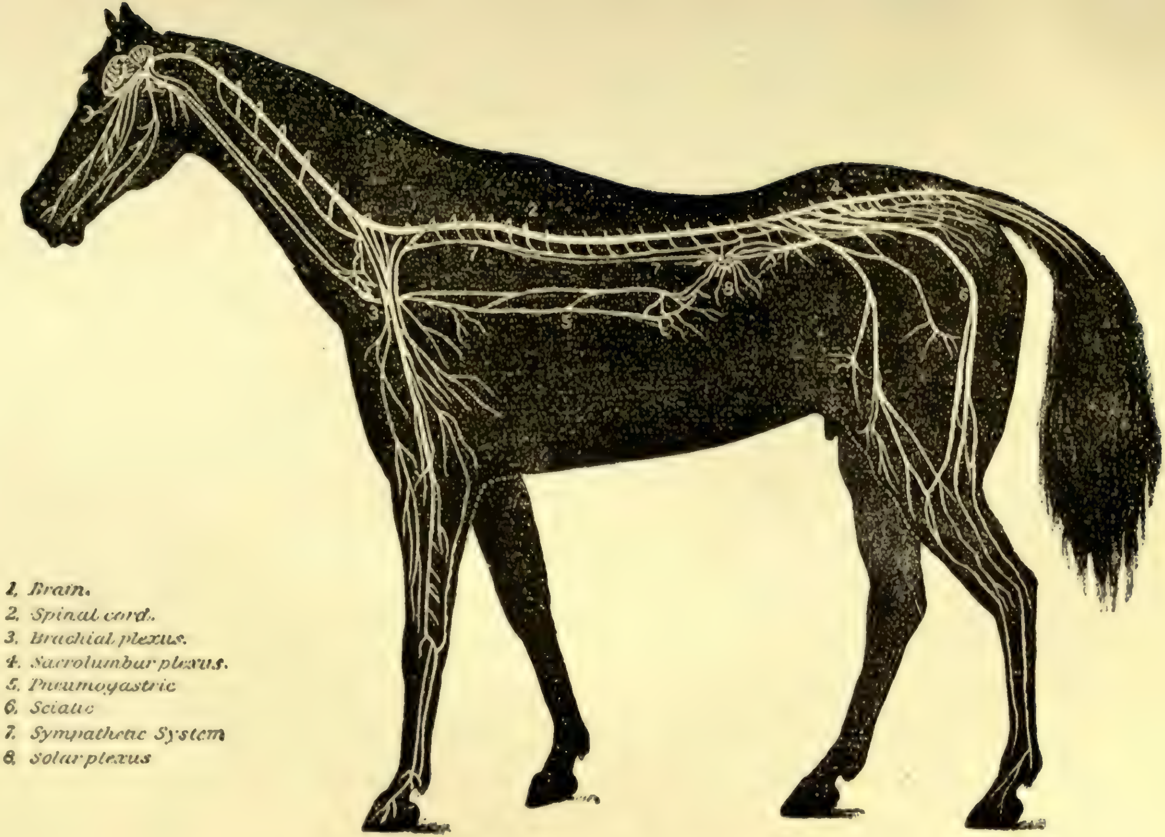
Other but less frequent causes for this affection are: Fractures of the bones that involve the membrane of the sinuses, and even blows on the head over the sinuses. Diseased teeth often involve a sinus and cause a fetid discharge from the nostril. Violent coughing is said to have forced particles of food into the sinus, which acted as a cause of the disease. Tumors growing in the sinuses are known to have caused it. It is also attributed to disease of the turbinated bones. Absorption of the bones forming the walls of the sinuses has been caused by the pressure of pus collecting in them and by tumors filling up the cavity.

Symptoms.—Great caution must be exercised when examining these cases, for the horse may have glanders; while, on the other hand, horses have been condemned as glandered when really there was nothing ailing them but nasal gleet. This affection is not contagious. It may stubbornly resist treatment and last for a long time. In most cases the discharge is from one nostril only, which may signify that the sinuses on that side of the head are affected. The discharge may be intermittent, that is, quantities may be discharged at times and again little or none for a day or so. Such an intermittent discharge usually signifies disease of the sinuses. The glands under and between the bones of the lower jaw may be enlarged. The peculiar ragged-edged ulcer of glanders is not to be found on the membrane within the nostrils, but occasionally sores are to be seen there. If there is any doubt about it, study well the symptoms of glanders to enable you to be at least competent to form a safe opinion.

The eye on the side of the discharging nostril may have a peculiar appearance and look smaller than its fellow. There may be an enlargement, having the appearance of a bulging out of the bone over the part affected, between or below the eyes. The breath may be offensive, which indicates decomposition of the matter or bones, or disease of the teeth. A diseased tooth is further indicated by the horse holding his head to one side when eating, or by dropping the food from the mouth after partly chewing it. When you tap on the bones between the eyes, below the eyes, and above the back teeth of the upper jaw, a hollow, drumlike sound is emitted, but if the sinus is filled with pus or contains a large tumor the sound emitted will be the same as if a solid substance were struck; by this means the sinus affected may be located in some instances. The hair may be rough over the affected part, or even the bone may be soft to the touch and the part give somewhat to pressure or leave an impression where it is pressed upon with the finger.

Treatment.—The cause of the trouble must be ascertained before treatment is commenced. In the many cases where the animal is in poor condition (in fact, in all cases) he should have the most nutritive food and regular exercise. The food, or box containing it, should be placed on the ground, as the dependent position of the head favors the discharge.

The cases that do not require a surgical operation must, as a rule, have persistent medical treatment. Mineral tonics and local medication are of the most value. For eight days give the following mixture: Reduced iron, 3 ounces; powdered nux vomica, 1 ounce. Mix and make into sixteen powders. Give one powder mixed with the food twice a day. Sulphur burnt in the stable while the animal is there to inhale its fumes is also a valuable adjunct. Care should be taken that the fumes of the burning sulphur are sufficiently diluted with air, so as not to suffocate the horse. Chloride of lime sprinkled around the stall is good. Also keep a quantity of the chloride under the hay in the manger, so that the gases will be inhaled as the horse holds his head over the hay while



THE NERVOUS SYSTEM

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eating. Keep the nostrils washed, and keep the discharge cleaned away from the manger and stall. The horse may be caused to inhale creolin vapor by pouring 2 ounces into hot water and fumigating in the usual way.

If the nasal gleet is the result of a diseased tooth, the tooth must be removed. The operation of trephining is the best possible way to remove the tooth in such cases, as it immediately opens the cavity which can be attended to direct. In all those cases of nasal gleet where sinuses contain either collections of pus or tumors, the only relief is by the trephine; and, no matter how thoroughly described, this is an operation that will be very seldom attempted by the non-professional. It would therefore be a waste of time to give the *modus operandi.*

THICKENING OF THE MEMBRANE.

This is sometimes denoted by a chronic discharge, a snuffling in the breathing, and a contraction of the nostril. It is a result of common cold and requires the same treatment as prescribed for nasal gleet, namely, the sulphate of iron, sulphate of copper, iodide of potassium, etc. The membranes of both sides may be affected, but one side only is the rule; and the affected side may be easily detected by holding the hand tightly over one nostril at a time. When the healthy side is closed in this manner, the breathing through the affected side will demonstrate a decreased caliber or an obstruction.

NASAL POLYPUS.

Tumors with narrow bases (somewhat pear-shaped) are occasionally found attached to the membrane of the nasal chambers, and are obstructions to breathing through the side in which they are located. They vary much in size; some are so small that their presence is not manifested, while others almost completely fill up the chamber, thereby causing a serious obstruction to the passage of air. The stem, or base, of the tumor is generally attached high up in the chamber, and usually the tumor can not be seen, but occasionally it increases in size until it can be observed within the nostril. Sometimes, instead of hanging down toward the nasal opening, it falls back into the pharynx. It causes a discharge from the nostril, a more or less noisy snuffling sound in breathing, according to its size, a discharge of blood (if it is injured), and sneezing. The side that it occupies can be detected in the same way as described for the detection of the affected side when the breathing is obstructed by a thickened membrane.

The only relief is removal of the polypus, which, like all other operations, should be done by an expert when it is possible to secure one. The operation is performed by grasping the base of the tumor with suitable forceps and twisting it round and round until it is torn from its attachment, or by cutting it off with a noose of wire. The resulting hemorrhage is checked by the use of a lotion, such as a solution of the tincture of iron, or by packing the nostrils with surgeon's gauze.

PHARYNGEAL POLYPUS.

This is exactly the same kind of tumor described as nasal polypus, the only difference being in the situation. Indeed, the stem of the tumor may be attached to the membrane of the nasal chamber, as before explained, or it may be attached in the fauces (opening of the back part of the mouth), and the body of the tumor then falls into the pharynx. In this situation it may seriously interfere with breathing. Sometimes it drops into the larynx, causing the most alarming symptoms. The animal coughs, or tries to cough, saliva flows from the mouth, the breathing is performed with the greatest difficulty and accompanied by a loud noise; the animal appears as if strangled and often falls exhausted. When the tumor is coughed out of the larynx the animal regains quickly and soon appears as if nothing was ailing. These sudden attacks and quick recoveries point to the nature of the trouble. The examination must be made by holding the animal's mouth open with a balling iron or speculum and running the hand back into the mouth. If the tumor is within reach, it must be removed in the same manner as though it were in the nose.

BLEEDING FROM THE NOSE.

This often occurs during the course of certain diseases, namely, influenza, bronchitis, purpura hemorrhagica, glanders, etc. But it also occurs independent of other affections; and, as before mentioned, is a symptom of polypus, or tumor, in the nose.

Injuries to the head, exertion, violent sneezing—causing a rupture of a small blood vessel—also induce it. The bleeding is almost invariably from one nostril only, and is never very serious. The blood escapes in drops (very seldom in a stream) and is not frothy, as when the hemorrhage is from the lungs. In most cases bathing the head and washing out the nostril with cold water are all that is necessary. If the cause is known, you will be guided according to circumstances. If the bleeding continues, pour ice-cold water over the face, between the eyes and down over the nasal chambers. A bag containing ice in small pieces applied to the head is often efficient. If in spite of these measures the hemorrhage continues, try plugging the nostrils with cotton or oakum. Tie a string around the plug before it is pushed up into the nostril, so that it can be safely withdrawn after four or five hours. If both nostrils are bleeding, plug only one nostril at a time. If the hemorrhage is profuse and persistent, give a drench composed of 1 dram of acetate of lead dissolved in 1 pint of water; or ergot, 1 ounce.

INFLAMMATION OF THE PHARYNX.

As already stated, the pharynx is common to the functions of both respiration and alimentation. From this organ the air passes into the larynx and thence onward to the lungs. In the posterior part of the pharynx is the superior extremity of the gullet, the canal through which the food and water pass to the stomach. Inflammation of the pharynx is a complication of other diseases—namely, influenza, strangles, etc.—and is probably always more or less complicated with inflammation of the larynx. That it may exist as an independent affection there is no reason to doubt, and it is discussed as such with the diseases of the digestive tract.

SORE THROAT, OR LARYNGITIS.

The larynx is situated in the space between the lower jawbones just back of the root of the tongue. It may be considered as a box (somewhat depressed on each side), composed principally of cartilages and small muscles, and lined on the inside with a continuation of the respiratory mucous membrane. Posteriorly it opens into and is continuous with the windpipe. It is the organ of the voice, the vocal cords being situated within it; but in the horse this function is of little consequence. It dilates and contracts to a certain extent, thus regulating the volume of air passing through it. The mucous membrane lining it internally is so highly sensitive that if the smallest particle of food happens to drop into it from the pharynx violent coughing ensues instantly and is continued until the source of irritation is ejected. This is a provision of nature to prevent foreign substances gaining access to the lungs. That projection called Adam's apple in the neck of man is the prominent part of one of the cartilages forming the larynx. Inflammation of the larynx is a serious and sometimes a fatal disease, and, as before stated, is usually complicated with inflammation of the pharynx, constituting what is properly known as sore throat. The chief causes are chilling and exposure.

Symptoms.—About the first symptom noticed is cough, followed by difficulty in swallowing, which may be due to soreness of the membrane of the pharynx, over which the food or water must pass, or to the pain caused by the contraction of the muscles necessary to impel the food or water onward to the gullet; or this same contraction of the muscles may cause a pressure on the larynx and produce pain. In many instances the difficulty in swallowing is so great that water, and in some cases food, is returned through the nose. This, however, does not occur from laryngitis alone, but only when the pharynx is involved in the inflammation. The glands between the lower jawbones and below the ears may be swollen. Pressure on the larynx induces coughing. The head is more or less poked out, and has the appearance of being stiffly carried. The membrane in the nose becomes red. A discharge from the nostrils soon appears. As the disease advances, the breathing may assume a more or less noisy character; sometimes a harsh rasping snore is emitted with every respiration, the breathing becomes hurried, and occasionally the animal seems threatened with suffocation.

Treatment.—In all cases steam the nostrils, as has been advised for cold in the head. In bad cases cause the steam to be inhaled continuously for hours—until relief is afforded. Have a fresh bucketful of boiling water every fifteen or twenty minutes. In each bucketful of water put a tablespoonful of oil of turpentine, the vapor of which will be carried along with the steam to the affected parts and have a beneficial effect. In mild cases steaming the nostrils five, six, or seven times a day will suffice.

The animal should be placed in a comfortable, dry stall (a box stall preferred), and should have a pure atmosphere to breathe. The body should be blanketed, and bandages applied to the legs. The diet should consist of soft food—bran mashes, scalded oats, linseed gruel, and, best of all, grass, if in season, which should be fresh. The manger, or trough, should not be too high nor too low, but a temporary one should be constructed at about the height he carries his head. Having to reach too high or too low may cause so much pain that the animal would rather forego satisfying what little appetite he might have than inflict pain by craning his head for food or water. A supply of fresh water should be before him all the time; he will not drink too much, nor will the cold water hurt him. Constipation (if present) must be relieved by enemas of warm water, administered three or four times during the twenty-four hours.

A liniment composed of 2 ounces of olive oil and 1 ounce each of solution of ammonia and tincture of cantharides, well shaken together, may be thoroughly rubbed in about the throat from ear to ear, and about 6 inches down over the windpipe, and in the space between the lower jaws. This liniment should be applied once a day for two or three days. If the animal is breathing with great difficulty, persevere in steaming the nostrils, and dissolve 2 drams of chlorate of potassium in every gallon of water he will drink; even if he can not swallow much of it, and even if it is returned through the nostrils, it will be of some benefit to the pharynx as a gargle.

An electuary of acetate of potash, 2 drams, honey, and licorice powder may be spread on the teeth with a paddle every few hours. If the pain of coughing is great, 2 or 3 grains of morphine may be added to the electuary. When the breathing begins to be loud relief is afforded in some cases by giving a drench composed of 2 drams of fluid extract of jaborandi in half a pint of water. If benefit is derived, this drench may be repeated four or five hours after the first dose is given. It will cause a free flow of saliva from the mouth.

Sore throat is also a symptom of other diseases, such as influenza, strangles, purpura hemorrhagica, etc., which diseases may be consulted under their proper headings. After a severe attack of inflammation of the larynx the mucous membrane may be left in a thickened condition, or an ulceration of the part may ensue, either of which is liable to produce a chronic cough. For the ulceration it is useless to prescribe, because it can neither be diagnosed nor topically treated by the nonprofessional.

If a chronic cough remains after all the other symptoms have disappeared, it is advisable to give 1 dram of iodide of potassium dissolved in a bucketful of drinking water, one hour before feeding, three times a day for a month if necessary. Also rub in well the preparation of iodide of mercury about the throat, from ear to ear, and in the space between the lower jaw bones. The application may be repeated every third day until the part is blistered.

SPASM OF THE LARYNX.

The symptoms are as follows: Sudden seizure by a violent fit of coughing; the horse may reel and fall, and after a few minutes recover and be as well as ever. The treatment recommended is this: Three drams of bromide of potassium three times a day, dissolved in the drinking water, or give as a drench in about a half pint of water for a week. Then give 1 dram of powdered nux vomica (either on the food or shaken with water as a drench) once a day for a few weeks.

THICK WIND AND ROARING.

Horses that are affected with a chronic disease that causes a loud unnatural noise in breathing are said to have thick wind, or to be roarers. This class does not include those affected with severe sore throat, as in these cases the breathing is noisy only during the attack of the acute disease.

Thick wind is caused by an obstruction to the free passage of the air in some part of the respiratory tract. Nasal polypi, thickening of the membrane, pharyngeal polypi, deformed bones, paralysis of the wing of the nostril, etc., are occasional causes. The noisy breathing of horses after having been idle and put to sudden exertion is not due to any disease and is only temporary. Very often a nervous, excitable horse will make a noise for a short time when started off, generally caused by the cramped position in which the head and neck are forced in order to hold him back.

Many other causes may occasion temporary, intermitting, or permanent noisy respiration, but chronic roaring is caused by paralysis of the muscles of the larynx; and almost invariably it is the muscles of the left side of the larynx that are affected. In chronic roaring the noise is made when the air is drawn into the lungs; and only when the disease is far advanced is a sound produced when the air is expelled, and even then it is not near so loud as during inspiration.

In a normal condition the muscles dilate the aperture of the larynx by moving outward the cartilage and vocal cord, allowing a sufficient volume of air to rush through. But when the muscles are paralyzed the cartilage and vocal cord that are normally controlled by the affected muscles lean into the tube of the larynx, so that when the air rushes in it meets this obstruction and the noise is produced. When the air is *expelled from the lungs* its very force pushes the cartilage and vocal cords out, and consequently noise is not produced in the expiratory act.

The paralysis of the muscles is due to derangement of the nerve that supplies them with energy. The muscles of both sides are not supplied by the same nerve; there is a right and a left nerve, each supplying its respective side. The reason why the muscles on the left side are the ones usually paralyzed is owing to the difference in the anatomical arrangement of the nerves. The left nerve is much longer and more exposed to interference than the right nerve.

In chronic roaring there is no evidence of any disease of the larynx other than the wasted condition of the muscles in question. The disease of the nerve is generally located far from the larynx. Disease of parts contiguous to the nerve along any part of its course may interfere with its proper function. Enlargement of lymphatic glands within the chest through which the nerve passes on its way back to the larynx is the most frequent interruption of nervous supply, and consequently roaring. When roaring becomes confirmed, medical treatment is entirely useless, as it is impossible to restore the wasted muscle and at the same time remove the cause of the interruption of the nervous supply. Before roaring becomes permanent the condition may be benefited by a course of iodide of potassium, if caused by disease of the lymphatic glands. Electricity has been used with indifferent success. Blistering or firing over the larynx is, of course, not worthy of trial if the disease is due to interference of the nerve supply. The administration of strychnia (nux vomica) on the ground that it is a nerve tonic with the view of stimulating the affected muscles is treating only the result of the disease without considering the cause, and is therefore useless. The operation of extirpating the collapsed cartilage and vocal cord is believed to be the only relief, and, as this operation is critical and can only be performed by the skillful veterinarian, it will not be described here.

From the foregoing description of the disease it will be seen that the name roaring, by which the disease is generally known, is only a symptom and not the disease. Chronic roaring is also in many cases accompanied by a cough. The best way to test whether a horse is a roarer is either to make him pull a load rapidly up a hill or over a sandy road or soft ground; or, if he is a saddle horse, gallop him up a hill or over soft ground. The object is to make him exert himself. Some horses require a great deal more exertion than others before the characteristic sound is emitted. The greater the distance he is forced, the more he will appear exhausted if he is a roarer; in bad cases the animal becomes utterly exhausted, the breathing is rapid and difficult, the nostrils dilate to the fullest extent, and the animal appears as if suffocation was imminent. An animal that is a roarer should not be used for breeding purposes. The taint is transmissible in many instances.

Grunting.—A common test used by veterinarians when examining the wind of a horse is to see if he is a grunter. This is a sound emitted during expiration when the animal is suddenly moved, or startled, or struck at. If he grunts he is further tested for roaring. Grunters are not always roarers, but, as it is a common thing for a roarer to grunt, such an animal must be looked upon with suspicion until he is thoroughly tried by pulling a load or galloped up a hill. The test should be a severe one. Horses suffering with pleurisy, or rheumatism, and other affections accompanied with much pain, will grunt when moved, or when the pain is aggravated, but grunting under these circumstances does not justify the term of "grunter" being applied to the horse, as the grunting ceases when the animal recovers from the disease that causes the pain.

High Blowing.—This term is applied to a noisy breathing made by some horses. It is distinctly a nasal sound, and must not be confounded with roaring. The sound is produced by the action of the nostrils. It is a habit and not an unsoundness. Contrary to roaring, when the animal is put to severe exertion the sound ceases. An animal that emits this sound is called a high-blower. Some horses have, naturally, very narrow nasal openings, and they may emit sounds louder than usual in their breathing when exercised.

Whistling is only one of the variations of the sound emitted by a horse called a roarer, and therefore needs no further notice, except to remind the reader that a whistling sound may be produced during an attack of severe sore throat or inflammation of the larynx, which passes away with the disease that causes it.

CHRONIC BRONCHITIS.

This may be due to the same causes as acute bronchitis or it may follow the latter disease. An attack of the chronic form is liable to be converted into acute bronchitis by a very slight cause. This chronic affection in most instances is associated with thickening of the walls of the tubes. Its course is slower, it is less severe, and is not accompanied with as much fever as the acute form. If the animal is exerted, the breathing becomes quickened and he soon shows signs of exhaustion. In many instances the animal keeps up strength and appearances moderately well, but in other cases the appetite is lost, flesh gradually disappears, and he becomes emaciated and debilitated. It is accompanied by a persistent cough, which in some cases is husky, smothered, or muffled, while in other cases it is hard and clear. A whitish matter is discharged from the nose, which may be curdled in some instances. If the ear is placed against the chest behind the shoulder blade, the rattle of the air passing through the mucus can be heard within.

Treatment.—Rest is necessary, as even under the most favorable circumstances a cure is difficult to effect. The animal can not stand exertion and should not be compelled to undergo it. The animal should have much the same general care and medical treatment prescribed for the acute form. Arsenic may be given in the form of Fowler's solution, 1 ounce three times daily in the drinking water. An application of mustard applied to the breast is a beneficial adjunct. The diet should be the most nourishing. Avoid bulky food. Linseed mashes, scalded oats, and, if in season, grass and green-blade fodder are the best diet.

THE LUNGS.

The lungs are the essential organs of respiration. They consist of two (right and left) spongy masses, commonly called the "lights," situated entirely within the thoracic cavity. On account of the space taken up by the heart, the left lung is the smaller.

CONGESTION OF THE LUNGS.

Congestion is essentially an excess of blood in the vessels of the parts affected. Congestion of the lungs in the horse, when it exists as an independent affection, is generally caused by overexertion when the animal is not in a fit condition to undergo more than moderate exercise. Very often what is recognized as congestion of the lungs is but a symptom of exhaustion or dilatation of the heart.

The methods practiced by the trainers of running and trotting horses will give an idea of what is termed putting a horse in condition to stand severe exertion. The animal at first gets walking exercises, then after some time he is made to go faster and farther each day; the amount of work is daily increased until the horse is said to be in condition. An animal so prepared runs no risk of being affected with congestion of the lungs, if he is otherwise healthy. On the other hand, if the horse is kept in the stable for the purpose of laying on fat or for want of something to do, the muscular system becomes soft, and the horse is not in condition to stand the severe exertion of going fast or far, no matter how healthy he may be in other respects. If such a horse be given a hard ride or drive, he may start off in high spirits, but soon becomes exhausted, and if he is pushed he will slacken his pace, show a desire to stop, and may stagger or even fall. Examination will show the nostrils dilated, the flanks heaving, the countenance haggard, and the appearance of suffocation. The heart and muscles were not accustomed to the sudden and severe strain put upon them; the heart became unable to perform its work; the blood accumulated in the vessels of the lungs, which eventually became engrossed with the stagnated blood, constituting congestion of the lungs.

The animal, after having undergone severe exertion, may not exhibit alarming symptoms until returned to the stable; then he will be noticed standing with his head down, legs spread out, the eyes wildly staring or dull and sunken. The breathing is very rapid and almost gasping; the body is covered with perspiration in most cases, which, however, may soon evaporate, leaving the surface of the body and the legs and ears cold; the breathing is both abdominal and thoracic; the chest rises and falls and the flanks are powerfully brought into action. If the pulse can be felt at all it will be found beating very frequently, one hundred or so to a minute. The heart may be felt tumultuously thumping if the hand is placed against the chest behind the left elbow, or it may be scarcely perceptible. The animal may tremble all over the body. If the ear is placed against the side of the chest a loud murmur will be heard and perhaps a fine crackling sound. One can scarcely fail to recognize a case of congestion of the lungs when brought on by overexertion, as the history of the case indicates the nature of the ailment. In all cases of suffocation the lungs are congested. It is also seen in connection with other diseases.

Treatment.—If the animal is attacked by the disease while on the road, stop him immediately. Do not attempt to return to the stables. If he is in the stable, make arrangements at once to insure an unlimited supply of pure air. If the weather is warm, out in the open air is the best place, but if too cold let him stand with head to the door. Let him stand still; he has all he can do, if he obtains sufficient pure air to sustain life. If he is encumbered with harness or saddle, remove it at once and rub the body with cloths or wisps of hay or straw. This stimulates the circulation in the skin, and thus aids in relieving the lungs of the extra quantity of blood that is stagnated there. If you have three or four assistants, let them rub the body and legs well until the skin feels natural; rub the legs until they are warm, if possible. When the circulation is re-established, put bandages on the legs from the hoofs up as far as possible. Throw a blanket over the body and let the rubbing be done under the blanket. Diffusible stimulants are the medicines indicated—brandy, whisky (or even ale or beer if nothing else is at hand), ether and aromatic spirits of ammonia. Two ounces each of spirits of nitrous ether and alcohol, given as a drench diluted with a pint of water, every hour until relief is afforded, is among the best remedies. Or, give a quarter of a pint of whisky in a pint of water every hour, or the same quantity of brandy as often, or a quart of ale every hour, or 1 ounce of tincture of arnica in a pint of water every hour until five or six doses have been given. If none of these remedies is at hand, 2 ounces of oil of turpentine, shaken with a half pint of milk, may be given once, but not repeated. The animal may be bled from the jugular vein. Do not take more than 5 or 6 quarts from the vein, and do not repeat the bleeding. The blood thus drawn will have a tarry appearance.

When the alarming symptoms have subsided active measures may be stopped, but care must be used in the general treatment of the animal for several days, for it must be remembered that congestion may be followed by pneumonia. The animal should have a comfortable stall, where he will not be subjected to drafts or sudden changes of temperature; he should be blanketed and the legs kept bandaged. The air should be pure, a plentiful supply of fresh cold water always in the stall, and a diet composed principally of bran mashes, scalded oats, and, if in season, grass. When ready for use again the horse should at first receive moderate exercise only, which may be daily increased until he may safely be put to regular work.

PNEUMONIA, OR LUNG FEVER.

Pneumonia is inflammation of the lungs. The chief varieties of pneumonia are catarrhal—later discussed in connection with bronchitis, under the name of broncho-pneumonia—and the fibrinous or croupous variety. The latter form receives its name from the fact that the air spaces are choked with coagulated fibrin thrown out from the blood. This causes the diseased portions of the lungs to become as firm as liver, in which condition they are said to be hepatized. As air is excluded by the inflammatory product, the diseased lung will not float in water.

The inflammation usually begins in the lower part of the lung and extends upward. The first stage of the disease consists of congestion, or engorgement, of the blood vessels, followed by leakage of serum containing fibrin from the blood vessels into the air passages. The fluids thus escaping into the air cells and in the minute branches of the little bronchial tubes become coagulated.

The pleura covering the affected parts may be more or less inflamed. A continuance of the foregoing phenomena is marked by a further escape of the constituents of the blood, and a change in the membrane of the cells, which become swollen. The exudate that fills the air cells and minute bronchial branches undergoes disintegration and softening when healing commences.

The favorable termination of pneumonia is in resolution, that is, a restoration to health. This is gradually brought about by the exuded material contained in the air cells and lung tissues becoming broken down and softened and absorbed or expectorated through the nostrils. The blood vessels return to their natural state, and the blood circulates in them as before. In the cases that do not terminate so happily the lung may become mortified, or an abscess may form, or the disease may be merged into the chronic variety.

Pneumonia may be directly induced by any of the influences named as general causes for diseases of the organs of respiration, but in many instances it is due to neglect. A common cold or sore throat may be followed by pneumonia if neglected or improperly treated. An animal may be debilitated by a cold, and when in this weakened state may be compelled to undergo exertion beyond his strength; or he may be kept in bad quarters, such as a badly ventilated stable, where the foul gases are shut in and the pure air is shut out; or the stable may be so open that parts of the body are exposed to drafts of cold air. An animal is predisposed to pneumonia when debilitated by any constitutional disease, and especially during convalescence if exposed to any of the exciting causes. Foreign bodies, such as food, accidentally getting in the lungs by way of the windpipe, as well as the inhalation of irritating gases and smoke, ofttimes produce fatal attacks of inflammation of the lungs and bronchial tubes. Pneumonia is frequently seen in connection with other diseases, such as influenza, purpura hemorrhagica, strangles, glanders, etc. Pneumonia and pleurisy are most common during cold, damp weather, and especially during the prevalence of the cold north and northeasterly winds. Wounds puncturing the thoracic cavity may cause pneumonia.

Symptoms.—Pneumonia, when a primary disease, is ushered in by a chill, more or less prolonged, which in many cases is seen neither by the owner nor the attendant, but is overlooked. The breathing becomes accelerated, and the animal hangs its head and has a very dull appearance. The mouth is hot and has a sticky feeling to the touch; the heat conveyed to the finger in the mouth demonstrates a fever; if the thermometer is placed in the rectum the temperature will be found to have risen to 103° F. or higher. The pulse is frequent, beating from fifty or sixty to eighty or more a minute. There is usually a dry cough from the beginning, which, however, changes in character as the disease advances; for instance, it may become moist, or if pleurisy sets in, the cough will be peculiar to the latter affection; that is, cut short in the endeavor to suppress it. In some cases the discharge from the nostrils is tinged with blood. The appetite is lost to a greater or less extent, but the desire for water is increased, particularly during the onset of the fever. The membrane within the nostrils is red and at first dry, but sooner or later becomes moist. The legs are cold. The bowels are more or less constipated, and what dung is passed is usually covered with a slimy mucus. The urine is passed in smaller quantities than usual and is of a darker color.

The animal prefers to have the head where the freshest air can be obtained. When affected with pneumonia a horse does not lie down, but persists in standing from the beginning of the attack. However, if pneumonia is complicated with pleurisy, the horse may appear restless and lie down for a few moments to gain relief from the pleuritic pains, but he soon rises. In pneumonia the breathing is rapid and difficult, but when the pneumonia is complicated with pleurisy the ribs are kept as still as possible and the breathing is abdominal; that is, the abdominal muscles are now made to do as much of the work as they can perform. If pleurisy is not present there is little pain. To the ordinary observer the animal may not appear dangerously ill, as he does not show the seriousness of the ailment by violence, as in colic, but a careful observer will discover at a glance that the trouble is something more serious than a cold. By percussion it will be shown that some portions of the chest are less resonant than in health, indicating exclusion of air. If the air is wholly excluded the percussion is quite dull, as that elicited by percussion over the thigh.

By auscultation important information may be gained. When the ear is placed against the chest of a healthy horse, the respiratory murmur is heard more or less distinctly, according to the part of the chest that is beneath the ear. In the very first stage of pneumonia this murmur is louder and hoarser; and, also, there is heard a fine crackling sound something similar to that produced when salt is thrown in a fire. After the affected part becomes solid there is an absence of sound over that particular part. After absorption begins one may again hear sounds that are of a more or less moist character and resemble a bubbling or gurgling noise, which gradually change until the natural sound is heard announcing return to health.

When a fatal termination is approaching all the symptoms become intensified. The breathing becomes still more rapid and difficult; the flanks heave; the animal stares wildly about as if seeking aid to drive off the feeling of suffocation; the body is bathed with sweat; the horse staggers, but quickly recovers his balance; he may now, for the first time during the attack, lie down; he does so, however, in the hope of relief, which he fails to find, and with difficulty struggles to his feet; he pants; the nostrils flap; he staggers and sways from side to side and backward and forward, but still tries to retain the standing position, even by propping himself against the stall. It is no use, as after an exhausting fight for breath he goes down; the limbs stretch out and become rigid. In fatal cases death usually occurs in from ten to twenty days after the beginning of the attack. On the other hand, when the disease is terminating favorably the signs are obvious. The fever abates and the animal gradually improves in appetite; he takes more notice of things around him; his spirits improve; he has a general appearance of returning health, and he lies down and rests. In the majority of cases pneumonia, if properly treated, terminates in recovery.

Treatment.—The comfort and surroundings of the patient must be attended to first. The quarters should be the best that can be provided. Pure air is essential. Avoid placing the animal in a stall where he may be exposed to drafts of cold air and sudden changes of temperature. It is much better for the animal if the air is cold and pure than if it is warm and foul. It is better to make the animal comfortable with warm clothing than to make the stable warm by shutting off the ventilation. The animal should have an unlimited supply of fresh cold drinking water from the start. Blanket the body. Rub the legs until they are warm and then put bandages on them from the hoofs up to the knees and hocks. If warmth can not be re-established in the legs by hand rubbing alone, apply dry ground mustard and rub well in. The bandages should be removed once or twice every day, the legs well rubbed, and the bandages replaced. Much harm is often done by clipping off hair and rubbing in powerful blistering compounds. They do positive injury and retard recovery, and should not be allowed. Much benefit may be derived from hot applications to the sides of the chest if the facilities are at hand to apply them. If the weather be not too cold, and if the animal is in a comfortable stable, the following method may be tried: Have a tub of hot water handy to the stable door; soak a woolen blanket in the water, then quickly wring as much water as possible out of it and wrap it around the chest. See that it fits closely to the skin; do not allow it to sag down so that air may get between it and the skin. Now wrap a dry blanket over the wet hot one and hold in place with three girths. The hot blanket should be renewed every half hour, and while it is off being wetted and wrung the dry one should remain over the wet part of the chest to prevent reaction. The hot applications should be kept up for three or four hours, and when stopped the skin should be quickly rubbed as dry as possible, an application of alcohol rubbed over the wet part, and a dry blanket snugly fitted over the animal. If the hot applications appear to benefit, they may be tried on three or four consecutive days. Unless every facility and circumstance favors the application of heat in the foregoing manner, do not attempt it. If the weather is very cold or any of the details are omitted, more harm than good may result. Mustard may be applied by making a paste with a pound of freshly ground mustard mixed with warm water. This is to be spread evenly over the sides back of the shoulder blades and down to the median line below the chest. Care should be taken to avoid rubbing the mustard upon the thin skin immediately back of the elbow.

The mustard-covered area should be covered with a paper and this with a blanket passed up from below and fastened over the back. The blanket and paper should be removed in from one to two hours. When pneumonia follows another disease, the system is always more or less debilitated and requires the careful use of stimulants from the beginning. To still further weaken the animal by bleeding him is one of the most effectual methods of retarding recovery, even if it does not hasten a fatal termination.

Another and oftentimes a fatal mistake made by the nonprofessional is the indiscriminate and reckless use of aconite. This drug is one of the most active poisons, and should not be handled by anyone who does not thoroughly understand its action and uses. It is only less active than prussic acid in its poisonous effects. It is a common opinion, often expressed by nonprofessionals, that aconite is a stimulant. Nothing could be more erroneous; in fact, it is just the reverse. It is one of the most powerful sedatives used in the practice of medicine. In fatal doses it kills by paralyzing the very muscles used in breathing; it weakens the action of the heart, and should not be used. Do not give purgative medicines. If constipation exists, overcome it by an allowance of laxative diet, such as scalded oats, bran, and linseed mashes, and, if in season, grass. If the costiveness is not relieved by the laxative diet, give an enema of about a quart of warm water three or four times a day.

A diet consisting principally of bran mashes, scalded oats, and when in season, grass or corn fodder is preferable if the animal retains an appetite; but if no desire is evinced for food of this particular description, then the animal must be allowed to eat anything that will be taken spontaneously. Hay tea, made by pouring boiling water over good hay in a large bucket and allowing it to stand until cool, then straining off the liquid, will sometimes create a desire for food. The animal may be allowed to drink as much of it as he desires. Corn on the cob is often eaten when everything else is refused. Bread may be tried; also apples or carrots. If the animal can be persuaded to drink milk, it may be supported by it for days. Three or 4 gallons of sweet milk may be given during the day, in which may be stirred 3 or 4 fresh eggs to each gallon of milk. Some horses will drink milk, while others will refuse to touch it. It should be borne in mind that all food must be taken by the horse as he desires it. No food should be forced down him. If the animal will not eat, you will only have to wait until a desire is shown for food. All kinds may be offered, first one thing and then another, but food should not be allowed to remain long in trough or manger; the very fact of it constantly being before him will cause him to loathe it. When the animal has no appetite for anything the stomach is not in a proper state to digest food, and if it is poured or drenched into him it will only cause indigestion and aggravate the case. It is a good practice to do nothing when there is nothing to be done that will benefit. This refers to medicine as well as food. Nothing is well done that is overdone.

If you can administer a ball or capsule, or have anyone at hand who is capable of doing it, a dram of sulphate of quinine in a capsule, or made into a ball, with sufficient linseed meal and molasses, given every three hours during the height of the fever, will do good in many cases. The ball of carbonate of ammonia as advised in the treatment of bronchitis, may be tried if the animal is hard to drench. The heart should be kept strong by administering digitalis in doses of 2 drams of the tincture every three hours, or strychnia 1 grain, made into a pill with liquorice powder, three times daily. If the horse becomes very much debilitated, stimulants of a more pronounced character are required. Six ounces of good whisky diluted with a pint of water may be given as often, instead of the foregoing.

During the period of convalescence good nutritive food should be allowed in a moderate quantity. Tonic medicines should be substituted for those used during the fever. The same medicines advised for the convalescing period of bronchitis are equally efficient in this case, especially the iodide of potash. Likewise, the same general instructions apply here. The chief causes of death in pneumonia are heart failure from exhaustion, suffocation, or blood poisoning from death of lung tissue. The greater the area of lung tissue diseased the greater the danger, hence double pneumonia is more fatal than pneumonia of one lung.

THE WINDPIPE.

The windpipe, or trachea, as it is technically called, is the flexible tube that extends from the larynx, which it succeeds at the throat, to above the base of the heart in the chest, where it terminates by dividing into the right and left bronchi—the tubes going to the right and left lung, respectively. The windpipe is composed of about fifty incomplete rings of cartilage united by ligaments. Internally the tube is lined with a continuation of the mucous membrane that lines the entire respiratory tract, which here has very little sensibility in contrast to that lining the larynx, which is endowed with exquisite sensitiveness.

The windpipe is not subject to any special disease, but is more or less affected during laryngitis (sore throat), influenza, bronchitis, etc., and requires no special treatment. The membrane may be left in a thickened condition after these attacks. One or more of the rings may be accidentally fractured, or the tube may be distorted or malformed as the result of violent injury. After the operation of tracheotomy it is not uncommon to find a tumor or malformation as a result, or sequel, of the operation. In passing over this section attention is merely called to these defects, as they require no particular attention in the way of treatment. However, it may be stated that any one of the before-mentioned conditions may constitute one of the causes of noisy respiration described as "thick wind."

GUTTURAL POUCHES.

These two sacs are situated above the throat, and communicate with the pharynx, as well as with the cavity of the tympanum of the ear. They are peculiar to solipeds. Normally, they contain air. Their function is unknown. One or both guttural pouches may contain pus. The symptoms are as follows: Swelling on the side below the ear and an intermittent discharge of matter from one or both nostrils, especially when the head is depressed.

The swelling is soft, and, if pressed upon, matter will escape from the nose if the head is depressed. As before mentioned, these pouches communciate with the pharynx, and through this small opening matter may escape. A recovery is probable if the animal is turned out to graze, or if he is fed from the ground, as the dependent position of the head favors the escape of matter from the pouches. In addition to this, give the tonics recommended for nasal gleet. If this treatment fails, an operation must be performed, which should not be attempted by any one unacquainted with the anatomy of the part.

BRONCHITIS AND BRONCHO-PNEUMONIA.

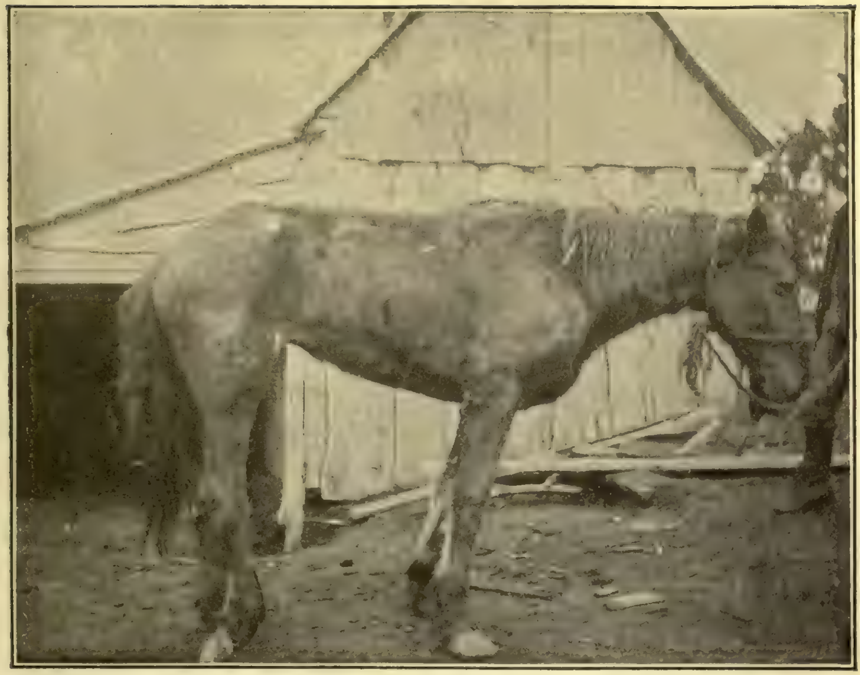
Bronchitis is an inflammation of the bronchial tubes. When this inflammation extends to the air sacs at the termini of the smallest branches of the bronchial tubes, the disease is broncho-pneumonia. Bronchitis affecting the larger tubes is less serious than when the smaller are involved. The diseases may be either acute or chronic. The causes are generally much the same as for other diseases of the respiratory organs, noticed in the beginning of this article. The special causes are these: The inhalation of irritating gases and smoke and fluids or solids gaining access to the parts. Bronchitis is occasionally associated with influenza and other specific fevers. It also supervenes on common cold or sore throat.

Symptoms.—The animal appears dull; the appetite is partially or wholly lost; the head hangs; the breathing is quickened; the cough, at first dry, and having somewhat the character of a barking cough, is succeeded in a few days by a moist, rattling cough; the mouth is hot; the visible membranes in the nose are red; the pulse is frequent, and during the first stage is hard and quick, but as the disease advances becomes smaller and more frequent. There is a discharge from the nostrils that is at first whitish, but later becomes creamy or frothy, and still later it is sometimes tinged with blood, and occasionally it may be of a brownish or rusty color. By auscultation, or placing the ear to the sides of the chest, unnatural sounds can now be heard. The air passing through the diseased tubes causes a wheezing sound when the small tubes are affected, and a hoarse, cooing, or snoring sound when the larger tubes are involved. After one or two days the dry stage of the disease is succeeded by a moist state of the membrane. The ear now detects a different sound, caused by the bursting of the bubbles as the air passes through the fluid, which is the exudate of inflammation and the augmented mucous secretions of the membrane. The mucus may be secreted in great abundance, which, by blocking up the tubes, may cause a collapse of a large extent of breathing surface. Usually the mucus is expectorated; that is, discharged through the nose. The matter is coughed up, and when it reaches the larynx much of it may be swallowed, and some is discharged from the nostrils. The horse can not spit, like the human being, nor does the matter coughed up gain access to the mouth. If in serious cases all the symptoms become aggravated, the breathing is labored, short, and quick, it usually indicates that the inflammation has reached the breathing cells and that catarrhal pneumonia is established. In this case the ribs rise and fall much more than natural. This fact alone is enough to exclude the idea that the animal may be affected with pleurisy, because, in pleurisy, the ribs are as nearly fixed as in the power of the animal to do so, and the breathing accomplished to a great extent by aid of the abdominal muscles. The horse persists in standing throughout the attack. He prefers to stand with head to a door or window to gain all the fresh air possible, but may occasionally wander listlessly about the stall if not tied. The bowels most likely are constipated; the dung is covered with slimy mucus. The urine is decreased in quantity and darker in color than usual. The animal shows more or less thirst; in some cases the mouth is full of saliva. The discharge from the nose increases in quantity as the disease advances and inflammation subsides. This is rather a good symptom, as it shows one stage has passed. The discharge then gradually decreases, the cough becomes less rasping, but of more frequent occurrence, until it gradually disappears with the return of health.

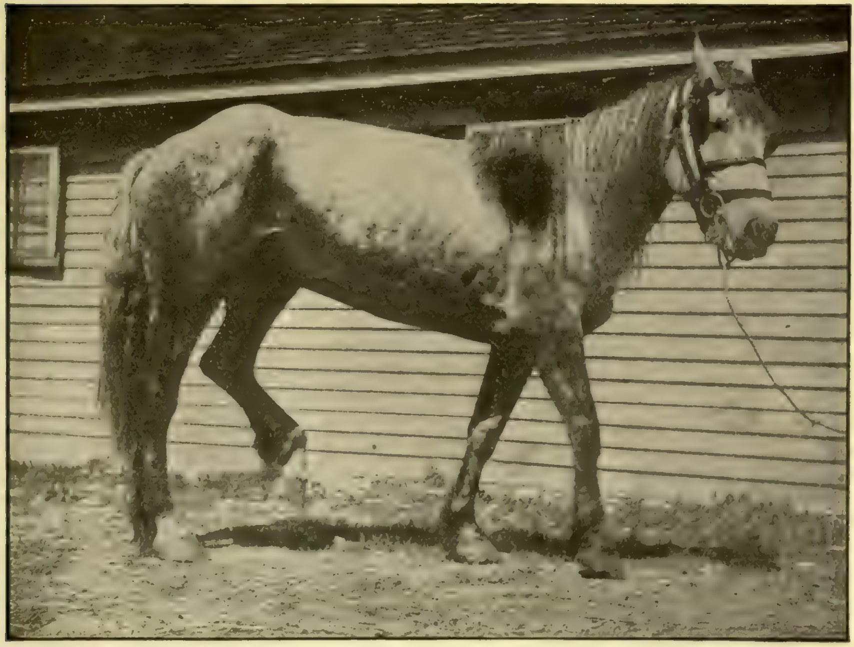
Bronchitis, affecting the smaller tubes, is one of the most fatal diseases, while that of the larger tubes is never very serious. It must be stated, however, that it is an exceedingly difficult matter for a nonexpert to discriminate between the two forms, and further, it may as well be said here that the nonexpert will have difficulty in discriminating between bronchitis and pneumonia.

Treatment.—The matter of first importance is to insure a pure atmosphere to breathe, and next to make the patient's quarters as comfortable as possible. A well-ventilated box stall serves best for all purposes. Cover the body with a blanket, light or heavy, as the season of the year demands. Hand rub the legs until they are warm, then wrap them in cotton and apply flannel bandages from the hoofs to the knees and hocks. If the legs can not be made warm with hand rubbing alone, apply dry mustard. Rub in thoroughly and then put on the bandages. Also rub mustard paste well over the side of the chest, covering the space beginning immediately behind the shoulder blade and running back about eighteen inches, and from the median line beneath the breast to within ten inches of the ridge of the backbone. Repeat the application to the side of the chest about three days after the first one is applied.

Compel the animal to inhale steam from a bucketful of boiling water containing a tablespoonful of oil of turpentine and spirits of camphor, as advised for cold in the head. In serious cases the steam should be inhaled every hour, and in any case the oftener it is done the greater will be the beneficial results. Three times a day administer an electuary containing acetate of potash (2 drams), with licorice and molasses or honey. It is well to keep a bucketful of cold water before the animal all the time. If the horse is prostrated and has no appetite, give the following drench: Spirits of nitrous ether, 2 ounces; rectified spirits, 3 ounces; water, 1 pint. Repeat the dose



MARE IN LAST STAGE OF DOURINE. DEPT. OF AGR.



PERCHERON MARE SHOWING CHRONIC DOURINE. DEPT. OF AGR.

every four or five hours if it appears to benefit. When the horse is hard to drench, give the following: Pulverized carbonate of ammonia, 3 drams; linseed meal and molasses sufficient to make the whole into a stiff mass; wrap it with a small piece of tissue paper and give as a ball. This ball may be repeated every four or five hours. When giving the ball care should be taken to prevent its breaking in the mouth, as in case of such accident it will make the mouth sore, which may prevent the animal from eating. If the bowels are constipated, give enemas of warm water. Do not give purgative medicines. Do not bleed the animal.

If the animal retains an appetite, a soft diet is preferable, such as scalded oats, bran mashes, and grass, if in season. If he refuses cooked food, allow in small quantities anything he will eat. Hay, cob corn, oats, bread, apples, and carrots may all be tried in turn. Some horses will drink sweet milk when they refuse all other kinds of food, and especially is this the case if the drinking water is withheld for a while. One or 2 gallons at a time, four or five times a day, will support life. Bear in mind that when the disease is established recovery cannot occur in less than two or three weeks, and more time may be necessary. Good nursing and patience are required.

When the symptoms have abated and nothing remains of the disease except the cough and a white discharge from the nostrils, all other medicines should be discontinued and a course of tonic treatment pursued. Give the following mixture: Reduced iron, 3 ounces; powdered gentian, 8 ounces; mix well together and divide into sixteen powders. Give a powder every night and morning mixed with bran and oats, if the animal will eat it, or shaken with about a pint of flaxseed tea and administered as a drench. Do not put the animal to work too soon after recovery. Allow ample time to regain strength. This disease is prone to become chronic and may run into an incurable case of thick wind.

PLEURISY.

The thoracic cavity is divided into two lateral compartments, each containing one lung and a part of the heart. Each lung has its separate pleural membrane, or covering. The pleura is the thin glistening membrane that covers the lung and also completely covers the internal walls of the chest. It is very thin, and to the ordinary observer appears to be part of the lung, which, in fact, it is for all practical purposes. The smooth, shiny surface of the lung, as well as the smooth, shiny surface so familiar on the rib, is the pleura. In health this surface is always moist. A fluid is thrown off by the pleura, which causes the surface to be constantly moist. This is to prevent the effects of friction between the lungs and the walls of the chest and other contiguous parts which come in contact. It must be remembered that the lungs are dilating each time a breath is taken in, and contracting each time a breath of air is expelled. It may be readily seen that if it were not for the moistened state of the surface of the pleura the continual dilation and contraction and the consequent rubbing of the parts against each other would cause serious friction.

Inflammation of this membrane is called pleurisy. Being so closely united with the lung, it can not always escape participation in the disease when the latter is inflamed. Pleurisy may be due to the same predisposing and exciting causes as mentioned in the beginning of this work as general causes for diseases of the organs of respiration, such as exposure to sudden changes of temperature, confinement in damp stables, etc. It may be caused by wounds that penetrate the chest, for it must be remembered that such wounds must necessarily pierce the pleura. A fractured rib may involve the pleura. The inflammation following such wounds may be circumscribed, that is, confined to a small area surrounding the wound, or it may spread from the wound and involve a large portion of the pleura. The pleura may be involved secondarily when the heart or its membrane is the primary seat of the disease. It may occur in conjunction with bronchitis, influenza, and other diseases. Diseased growths that interfere with the pleura may induce pleurisy. The most frequent cause of pleurisy is an extension of inflammation from adjacent diseased lung. It is a common complication of pneumonia. Pleurisy will be described here as an independent affection, although it should be remembered that it is very often associated with the foregoing diseases.

The first lesion of pleurisy is overfilling of the blood vessels that ramify in this membrane, and dryness of the surface. This is followed by the formation of a coating of coagulated fibrin on the diseased pleura and the transudation of serum which collects in the chest. This serum may contain flakes of fibrin and it may be straw colored or red from an admixture of blood. The quantity of this accumulation may amount to several gallons.

Symptoms.—When the disease exists as an independent affection it is ushered in by a chill, but this is usually overlooked. About the first thing noticed is the disinclination of the animal to move or turn round. When made to do so he grunts or groans with pain. He stands stiff; the ribs are fixed, that is, the ribs move very little in the act of breathing, but the abdomen works more than natural; both the fore feet and elbows may be turned out; during the onset of the attack the animal may be restless and act as if he had a slight colic; he may even lie down, but does not remain long down, for when he finds no relief he soon gets up. Every movement of the chest causes pain, therefore the cough is peculiar; it is short and suppressed, and comes as near being no cough as the animal can make it in his desire to suppress it. The breathing is hurried, the mouth it hot, the temperature being elevated from 102° or 103° to 105° F. The usual symptoms that accompany fever are present, such as costiveness, scanty dark-colored urine, etc. The pulse is frequent, perhaps 70 or more a minute. The legs and ears are cold.

Percussion is of valuable service in this affection. After effusion occurs, the sound produced by percussing over the lower part of the chest is dull. By striking different parts one may come to a spot of greater or less extent where the blows cause much pain to be evinced. The animal may grunt or groan every time it is struck.

Another method of detecting the affected part is to press the fingers between the ribs, each space in succession beginning behind the elbow, until you arrive at a place where the pressure causes more flinching than at any other part. Auscultation is also useful. In the first stage, when the surfaces are dry and rough, one may hear a friction sound very much like that produced by rubbing two pieces of coarse paper together. The sound appears immediately under the ear and is distinct. No such friction sound occurs when the membrane is healthy, as the natural moisture, heretofore mentioned, prevents the friction. In many cases this friction is so pronounced that it may be felt by placing the hand over the affected part. When the dry stage is succeeded by the exudation of fluid, this friction sound disappears. After the effusion into the cavity takes place there sometimes is heard a tinkling or metallic sound, due to dropping of the exudate from above into the collected fluid in the bottom of the cavity, as the collected fluid more or less separates the lung from the chest walls.

Within two or three days the urgent symptoms may abate owing to the exudation of the fluid and the subsidence of the pain. The fluid may now undergo absorption, and the case terminate favorably within a week or ten days.

If the quantity of the effusion is large, its volume retards the process of absorption to a great extent, and consequently convalescence is delayed. In severe cases the pulse becomes more frequent, the breathing more hurried and labored, the flanks work like bellows, the nostrils flap, the eyes stare wildly, the countenance expresses much anxiety, and general signs of dissolution are plain. After a time swellings appear under the chest and abdomen and down the legs. The accumulation in the chest is called hydrothorax, or dropsy of the chest. When this fluid contains pus the case usually proves fatal. The condition of pus within the cavity is called empyema. Pleurisy may affect only a small area of one side or it may affect both sides. It is oftener confined to the right side.

Treatment.—The instructions in regard to the general management of bronchitis and pneumonia must be adhered to in the treatment of pleurisy. Comfortable quarters, pure air, warm clothing to the body and bandages to the legs, a plentiful supply of pure cold water, the laxative food, etc., in this case are equally necessary and efficacious. The hot applications applied to the chest as directed in the treatment of pneumonia are very beneficial in pleurisy, and should be kept up while the symptoms show the animal to be in pain.

During the first few days, when pain is manifested by restlessness, apply hot packs to the sides diligently. After four or five days, when the symptoms show that the acute stage has somewhat subsided, mustard may be applied as recommended for pneumonia. From the beginning the following drench may be given every six hours, if the horse takes a drench kindly: Solution of the acetate of ammonia, 3 ounces; spirits of nitrous ether, 1 ounce; bicarbonate of potassium, 3 drams; water, 1 pint.

If the patient becomes debilitated, the stimulants as prescribed for pneumonia should be used according to the same directions. The same attention should be given to the diet. If the animal will partake of the bran mashes, scalded oats, and grass, it is the best; but if he refuses the laxative diet, then he should be tried with different kinds of food and allowed whichever kind he desires. In the beginning of the attack, if the pain is severe, causing the animal to lie down or paw, morphine may be given by the mouth in 5-grain doses, or the fluid extract of *Cannabis indica* may be used in doses of 2 to 4 drams.

If the case is not progressing favorably in ten or twelve days after the beginning of the attack, convalescence is delayed by the fluid in the chest failing to be absorbed. The animal becomes dull and weak and evinces little or no desire for food. The breathing becomes still more rapid and difficult. An effort must now be made to excite the absorption of the effusion. An application of liniment or mild blister should be rubbed over the lower part of both sides and the bottom of the chest. Also give 1 dram of iodide of potassium, dissolved in the drinking water, an hour before feeding every night and morning for a week or two.

Hydrothorax is sometimes difficult to overcome by means of the use of medicines alone, when the operation is performed of tapping the chest to allow an escape for the accumulated fluid. The operation is performed with a combined instrument called the trocar and canula. The puncture is made in the lower part of the chest, in the space between the eighth and ninth ribs. Wounding of the intercostal artery is avoided by inserting the instrument as near as possible to the anterior edge of the rib. If the operation is of benefit, it is only so when performed before the strength is lowered beyond recovery. The operation merely receives a passing notice here, as it is not presumed that the nonprofessional will attempt it, although it is attended with little danger or difficulty in the hands of the expert.

There have been described here bronchitis, pneumonia, and pleurisy mainly as they occur as independent diseases, but it should be remembered that they merge into each other and may occur together at one time. While it is true that much more might have been said in regard to the different stages and types of the affections, and also in regard to the treatment of each stage and each particular type, the plan adopted of advising plain, conservative treatment is considered the wisest on account of simplifying as much as possible a subject of which the reader is supposed to know very little.

PLEURO-PNEUMONIA.

This is the state in which an animal is affected with pleurisy and pneumonia combined, which is not infrequently the case. At the beginning of the attack only one of the affections may be present, but the other soon follows. It has already been stated that the pleura is closely adherent to the lung. The pleura on this account is frequently more or less affected by the spreading of the inflammation from the lung tissues. There is a combination of the symptoms of both diseases, but to the ordinary observer the symptoms of pleurisy are the most obvious. The course of treatment to be pursued differs in no manner from that given for the affections when they occur independently. The symptoms will be your guide as to the advisability of giving oil and laudanum for the pain if the pleurisy is very severe. Do not resort to it unless it is necessary to allay the pain.

HEMOPTYSIS, OR BLEEDING FROM THE LUNGS.

Bleeding from the lungs may occur during the course of congestion of the lungs, bronchitis, pneumonia, influenza, purpura hemorrhagica, or glanders. An accident or exertion may cause a rupture of a vessel. Following the rupture of a vessel the blood may escape into the lung tissue and cause a serious attack of pneumonia, or it may fill up the bronchial tubes and prove fatal by suffocating the animal. When the hemorrhage is from the lung it is accompanied by coughing; the blood is frothy, of a bright red color, and comes from both nostrils; whereas when the bleeding is merely from a rupture of a vessel in some part of the head the blood is most likely to issue from one nostril only, and the discharge is not accompanied by coughing. The ear may be placed against the windpipe along its course, and if the blood is from the lungs a gurgling or rattling sound will be heard. When it occurs in connection with another disease it seldom requires special treatment. When caused by accident or overexertion the animal should be kept quiet. If the hemorrhage is profuse and continues for several hours, 1 dram of the acetate of lead dissolved in a pint of water may be given as a drench. It is rare that the hemorrhage is so profuse as to require internal remedies. But hemorrhage into the lung may occur and cause death by suffocation without the least manifestation of it by the discharge of blood from the nose.

TUBERCULOSIS OF THE LUNGS.

Pulmonary consumption or tuberculosis has been recognized in the horse in a number of instances. The symptoms are as of chronic pneumonia or pleurisy. There is no treatment for the disease.

HEAVES, BROKEN WIND, OR ASTHMA.

Much confusion exists in the popular mind in regard to the nature of heaves. Many horsemen loosely apply the term to all ailments where the breathing is difficult or noisy. Scientific veterinarians are well acquainted with the phenomena and locality of the affection, but there is a great diversity of opinion as regards the exact cause. Asthma is generally thought to be due to spasm of the small circular muscles that surround the bronchial tubes. The continued existence of this affection of the muscles leads to a paralysis of them, and the forced breathing to emphysema, which always accompanies heaves.

Heaves is usually associated with disorder of the function of digestion or to an error in the choice of food. Feeding on clover hay or damaged hay or straw, too bulky and innutritious food, and keeping the horse in a dusty atmosphere or a badly ventilated stable produce or predispose to heaves. Horses brought from a high to a low level are predisposed. In itself broken wind is not a fatal disease, but death is generally caused by an affection closely connected with it.

Symptoms.—Almost every experienced horseman is able to detect heaves. The peculiar movement of the flanks and abdomen point out the ailment at once. But in recent cases the affected animal does not always exhibit the characteristic breathing unless exerted to a certain extent. The cough which accompanies this disease is peculiar to it. It is difficult to describe, but the sound is short, and something like a grunt. When air is inspired—that is, taken in—it appears to be done in the same manner as in health; it may possibly be done a little quicker than natural, but not enough to attract any notice. It is when the act of expiration (or expelling the air from the lungs) is performed that the great change in the breathing is perceptible. It must be remembered that the lungs have lost much of their elasticity, and, in consequence, of their power of contracting on account of the degeneration of the walls of the air cells, and also on account of the paralysis of muscular tissue before mentioned. The air passes into them freely, but the power to expel it is lost to a great extent by the lungs; therefore the abdominal muscles are brought into play. These muscles, especially in the region of the flank, are seen to contract, then pause for a moment, then complete the act of contracting, thus making a double bellowslike movement at each expiration, a sort of jerky motion with every breath. The double expiratory movement may also be detected by allowing the horse to exhale against the face or back of the hand. It will be observed that the expiratory current is not continuous, but is broken into two jets. When the animal is exerted a wheezing noise accompanies the breathing. This noise may be heard to a less extent when the animal is at rest if the ear be applied to the chest.

Certain individuals become very expert in managing a horse affected with heaves in suppressing the symptoms for a short time. They take advantage of the fact that the breathing is much easier when the stomach and intestines are empty. They also resort to the use of medicines that have a depressing effect. When the veterinarian is examining a horse for soundness, and he suspects that the animal has been fixed, he usually gives the horse as much water as he will drink and then has him ridden or driven rapidly up a hill or on a heavy road. This will bring out the characteristic breathing of heaves if the horse is so afflicted, but will not cause the symptoms of heaves in a healthy horse. All broken-winded horses have the cough peculiar to the affection, but it is not regular. A considerable time may elapse before it is heard and then it may come on in paroxysms, especially when first brought out of the stable into the cold air, or when excited by work, or after a drink of cold water. The cough is usually the first symptom of the disease.

Treatment.—When the disease is established there is no cure for it. Proper attention paid to the diet will relieve the distressing symptoms to a certain extent, but they will undoubtedly reappear in their intensity the first time the animal overloads the stomach or is allowed food of bad quality. Clover hay or bulky food which contains but little nutriment have much to do with the cause of the disease, and therefore should be entirely omitted when the animal is affected, as well as before. It has been asserted that the disease is unknown where clover hay is never used. The diet should be confined to food of the best quality and in the smallest quantity. The bad effect of moldy or dusty hay, fodder, or food of any kind can not be overestimated. A small quantity of the best hay once a day is sufficient. This should be cut and dampened. The animal should invariably be watered before feeding; never directly after a meal. The animal should not be worked immediately after a meal. Exertion, when the stomach is full, invariably aggravates the symptoms. Turning on pasture gives relief. Carrots, potatoes, or turnips chopped and mixed with oats or corn are a good diet. Half a pint to a pint of thick, dark molasses with each feed is useful. Arsenic is efficacious in palliating the symptoms. It is best administered in the form of the solution of arsenic, as Fowler's solution—1 ounce to drinking water 3 times a day. If the bowels do not act regularly, a pint of raw linseed oil may be given once or twice a month, or a handful of Glauber's salt may be given in the feed twice daily, so long as necessary. It must, however, be borne in mind that all medical treatment is of secondary consideration; careful attention paid to the diet is of greatest importance. Broken-winded animals should not be used for breeding purposes.

A CHRONIC COUGH.

A chronic cough may succeed the acute diseases of the respiratory organs, such as pneumonia, bronchitis, laryngitis, etc. It accompanies chronic roaring, chronic bronchitis, broken wind. It may succeed influenza. As previously stated, cough is but a symptom and not a disease in itself. Chronic cough is occasionally associated with diseases other than those of the organs of respiration. It may be a symptom of chronic indigestion or of worms. In such cases it is caused by a reflex nervous irritation. The proper treatment in all cases of chronic cough is to ascertain the nature of the disease of which it is a symptom, and then cure the disease if possible, and the cough will cease. The treatment of the affections will be found under their appropriate heads, to which the reader is referred.

PLEURO-DYNIA.

This is a form of rheumatism that affects the intercostal muscles; that is, the muscles between the ribs. The apparent symptoms are very similar to those of pleurisy. The animal is stiff and not inclined to turn around; the ribs are kept in a fixed state as much as possible. If the head is pulled round suddenly, or the affected side struck with the hand, or if the spaces between the ribs are pressed with the fingers, the animal will flinch and perhaps emit a grunt or groan expressive of much pain. It is distinguished from pleurisy by the absence of fever, cough, the friction sound, the effusion into the chest, and by the existence of rheumatism in other parts. The treatment for this affection is the same as for rheumatism affecting other parts.

WOUNDS PENETRATING THE WALLS OF THE CHEST.

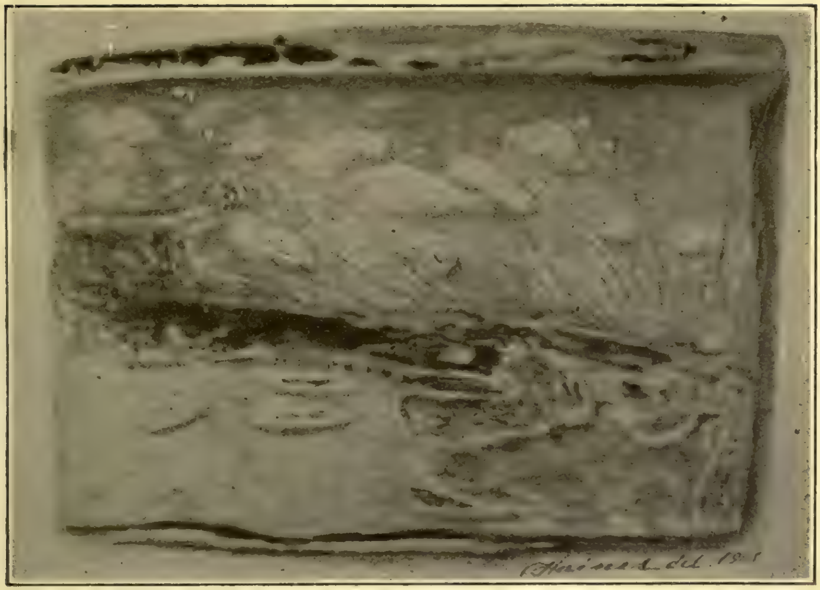
A wound penetrating the wall of the chest admits air into the thoracic cavity outside of the lung. This condition is known as pneumothorax and may result in collapse of the lung. The wound may be so made that when the walls of the chest are dilating a little air is sucked in, but during the contraction of the wall the contained air presses against the torn part in such a manner as entirely to close the wound; thus a small quantity of air gains access with each inspiration, while none is allowed to escape until the lung is pressed into a very small compass and forced into the anterior part of the chest. The same thing may occur from a broken rib inflicting a wound in the lung. In this form the air gains access from the lung, and there may not even be an opening in the walls of the chest. In such cases the air may be absorbed, when a spontaneous cure is the result. But when the symptoms are urgent it is recommended that the air be removed by a trocar and canula or by an aspirator.

It is evident that the treatment of wounds that penetrate the thoracic cavity should be prompt. It should be quickly ascertained whether or not a foreign body remains in the wound, then it should be thoroughly cleaned with a solution of carbolic acid, 1 part in water 40 parts. The wound should then be closed immediately. If it is an incised wound, it should be closed with sutures or with adhesive plasters; if torn or lacerated, adhesive plaster may be used or a bandage around the chest over the dressing. At all events, air must be prevented from getting into the chest as soon and as effectually as possible. The after treatment of the wound should principally consist in keeping the parts clean with a solution of carbolic acid, and applying fresh dressing as often as required to keep the wound in a healthy condition. Care should be taken that the discharges from the wound have an outlet in the most dependent part. If pleurisy supervenes, it should be treated as advised under that head.

THUMPS, OR SPASM OF THE DIAPHRAGM.

Thumps is generally thought by the inexperienced to be a palpitation of the heart. While it is true that palpitation of the heart is sometimes called thumps, it must not be confounded with the affection under consideration. In the beginning of this article on the diseases of the organs of respiration, the diaphragm was briefly referred to as the principal and essential muscle of respiration. Spasmodic or irregular contractions of it in man are manifested by what is familiarly known as hiccoughs. Thumps in the horse is similar to hiccoughs in man, although the peculiar noise is not made in the throat of the horse in all cases.

There should be no difficulty in distinguishing this affection from palpitation of the heart. The jerky motion affects the whole body, and is not confined to the region of the heart. If one hand is placed on the body at about the middle of the last rib, while the other hand is placed over the heart behind the left elbow, it will be easily demonstrated that there is no connection between the thumping or jerking of the diaphragm and the beating of the heart. In fact, when the animal is affected with spasms of the diaphragm the beating of the heart is usually much weaker and less perceptible than natural. Thumps is produced by causes similar to those that produce



Lesions of Glanders in Nasal Septum. B. A. I. 1910.

Barn Prepared for Fumigation. All Openings Covered. Dept. of Agr.

congestion of the lungs and dilatation or palpitation of the heart, and may occur in connection with these conditions. If not relieved, death usually results from congestion or edema of the lungs, as the breathing is interfered with by the inordinate action of this important muscle of inspiration so much that proper aeration of the blood can not take place. The treatment should be as prescribed for congestion of the lungs, and, in addition, antispasmodics, such as 1 ounce of sulphuric ether in warm water or 3 drams of asafetida.—(Spl. Rpt. Horse, Dept. Ag. 1911.)

WOUNDS AND THEIR TREATMENT.

DESCRIPTION OF WOUNDS.

A wound is an injury to any part of the body involving a solution of continuity or disruption of the affected parts and is caused by violence, with or without laceration of the skin. In accordance with this definition we have the following varieties of wounds: Incised, punctured, contused, lacerated, gunshot and poisoned. They may further be classified as superficial, deep, or penetrating, and also as unclean, if hair, dirt, or splinters of wood are present; as infected, when contaminated with germs; and as aseptic, if the wound does not contain germs.

An incised wound is a simple cut made with a sharp body, like a knife, producing merely a division of the tissues. The duller the body, the more force is required, the more tissues destroyed, and a greater time will be required for healing. In a cut wound the edges are even and definite, while those of a lacerated wound are irregular and torn. Three conditions are present as a result of an incised wound: (1) Pain; (2) hemorrhage; (3) gaping of the wound. The first pain is due to the crushing and tearing of the nerve fibers. In using a sharp knife and by cutting quickly, the animal suffers less pain and healing occurs more rapidly. The secondary pain is usually due to the action of the air and inflammatory processes. When air is kept from the wound pain ceases soon after the lesion is produced. Hemorrhage is absent only in wounds of the cornea of the eye, the cartilage of joints, and other similar structures. Bleeding may be from the arteries, veins, or capillaries. In the latter form of bleeding the blood oozes from the part in drops. Hemorrhage from the veins is dark red and issues in a steady stream without spurting. In arterial bleeding the blood is bright red and spurts with each heart beat. This latter variety of hemorrhage is the most dangerous, and should be stopped at once before attempting any further treatment. Bleeding from small veins and capillaries ceases in a short time spontaneously, while larger vessels, especially arteries, require some form of treatment to cause complete stoppage of the hemorrhage.

HEMOSTASIA.

By this term is meant the checking of the flow of blood. It may be accomplished by several methods, such as compress bandages, torsion, hot iron, and ligatures. The heat from a hot iron will cause the immediate clotting of the blood in the vessels, and this clot is further supported by the production of a scab, or crust, over the portion seared. The iron should be at a red heat. If at a white heat, the tissue is charred, which makes it brittle and the bleeding is apt to be renewed. If the iron is at a black heat, the tissue will stick to the iron and will pull away from the surface of the wound. Cold water and ice bags quickly stop capillary bleeding, while hot water is preferable in more excessive hemorrhages. Some drugs possess the power of contracting the walls of blood vessels and also of clotting the blood. A solution of the chloride of iron placed on a wound alone or by means of cotton drenched in the liquid produces a rapid and hard clot. Tannic acid, alum, acetic acid, alcohol, and oil of turpentine are all more or less active in this respect. To check bleeding from large vessels compression may be adopted. When it is rapid and dangerous and from an artery, the fingers may be used for pressing between the wound and the heart, but if from a vein, the pressure should be exerted on the other side of the wound. Tourniquet may also be used by passing a strap around the part and tightening after placing a pad over the hemorrhage. The rubber ligature has now replaced the tourniquet and is bound tightly around the limb to arrest the bleeding. Bleeding may sometimes be easily checked by passing a pin under the vessel and by taking a horsehair and forming a figure 8 by running it above and below the pin, thus causing pressure on the vessel. Torsion is the twisting of the blood vessel until the walls come together and form a barrier to the flow of blood. It may be accomplished by the fingers, forceps, or by running a pin through the vessel, turning it several times, and then running the point into the tissue to keep it in a fixed position.

Ligation is the third method for stopping a hemorrhage. Seize the blood vessel with the artery forceps, pass a clean thread of silk around it, and tie about one-half inch from its end. The silk should be sterilized by placing it in an antiseptic solution so as not to impede the healing process or cause blood poisoning or lockjaw, which often follows the ligation of a vein with unsterilized material. Sometimes it will be impossible to reach the bleeding vessel, so it is necessary to pass the ligature around a mass of tissue which includes the blood vessel. Ligation is the most useful method of arresting hemorrhage, since it disturbs healing least and gives the greatest security against secondary hemorrhage.

SUTURES.

After the bleeding has been controlled and all foreign bodies removed from the wound, the gaping of the wound is noticeable. It is caused by the contraction of the muscles and elastic fibers, and its degree depends on the extent, direction, and nature of the cut. This gaping will hinder the healing process so that it must be overcome by bringing the edges together by some sort of sutures or pins, or by a bandage applied from below upward. As suture material, ordinary cotton thread is good if well sterilized, as is also horsehair, catgut, silk, and various kinds of wire. If the suture is made too tight, the subsequent swelling may cause the stitch to tear out. In order to make a firm suture the depth of the stitch should be the same as the distance the stitch is from the edge of the wound. The deeper the suture the more tissue is embraced and the fewer the number of stitches required. Closure of wounds by means of adhesive plaster, collodion, and metal clamps is not practiced to any great extent in veterinary practice.

PROCESS OF HEALING.

In those cases where perfect stoppage of bleeding, perfect coaptation of the edges of the wound, and perfect cleanliness are obtained, healing occurs within three days, without the formation of granulations, pus, or proud flesh, by what is termed *first intention.* If wounds do not heal in this manner they will gap somewhat and become warm and painful. Healing then occurs by granulation or suppuration, which is termed healing by *second intention.* The sides of the wound become covered with granulation tissue which may fill the wound and sometimes overlap the lips, forming a growth called proud flesh. Under favorable conditions the edges of the wound appear to grow together by the end of the first week, and the whole surface gradually becomes dry, and finally covered with pigmented skin, when the wound is healed. The cause of pus formation in wounds is usually due to the presence of germs. For this reason the utmost care should be adopted to keep clean wounds aseptic, or free from germs, and to make unclean wounds antiseptic by using antiseptic fluids to kill the microbes present in the wound. The less the injurious action of this fluid on the wound, and the greater its power to kill germs, the more valuable it becomes. All antiseptics are not equally destructive, and some germs are more susceptible to one antiseptic than to another. The most important are (1) bichloride of mercury, which is to be preferred on horses. It becomes weakened in its action if placed in a wooden pail or on an oily or greasy surface. It is used in the strength of 1 part of bichloride to 1,000 to 5,000 parts of water, according to the delicacy of the tissue to which it is applied. (2) Carbolic acid in from 2 to 5 per cent solution is used on infected wounds and for cleaning instruments, dressings, and sponges. It unites well with oil and is preferred to the bichloride of mercury on a greasy surface. A 5 per cent solution in oil is often used under the name of carbolized oil. (3) Aluminum acetate is an efficient and cheap antiseptic, and is composed of 1 part alum and 5 parts acetate of lead, mixed in 20 parts of water. (4) Boracic acid is good in a 2 to 4 per cent solution to cleanse wounds and wash eyes. Creolin and lysol may be used in a 2 to 5 per cent solution in water. Iodoform is one of the most used of the antiseptics and it also acts as an anodyne, stimulates granulation, and checks wound secretion. A very efficacious and inexpensive powder is made by taking 5 parts of iodoform and 95 parts of sugar, making what is called iodoform sugar. Tannic acid is a useful drug in the treatment of wounds, in that it arrests hemorrhage, checks secretion, and favors the formation of a scab. A mixture of 1 part tannic acid and 3 parts iodoform is good in suppurating wounds. Iodol, white sugar, ground and roasted coffee, and powdered charcoal are all used as protectives and absorbents on suppurating surfaces. More depends on the care and the method of application of the drug than on the drug itself. On aseptic wounds use only those antiseptics that do not irritate the tissue. If care is used in the application of the antiseptic, corrosive sublimate or carbolic acid is to be recommended, but in the hands of irresponsible parties creolin is safer. In order to keep air from the wound and to absorb all wound secretions rapidly, a dressing should be applied. If the wound is aseptic, the dressing should be likewise, such as cotton gauze, sterile cotton, oakum, or tow. This dressing should be applied with uniform pressure at all times and secured by a bandage. Allow it to remain for a week or ten days if the wound is aseptic or if the dressing does not become loose or misplaced or become drenched with secretions from the wound, or if pain, fever, or loss of appetite does not develop. The dressing should then be removed, the wound treated antiseptically, and a sterilized dressing applied.

HEALING UNDER A SCAB.

This often occurs in small superficial wounds that have been kept aseptic. In order for a scab to form, the wound must not gap, secrete freely, or become infected with germs. The formation of scab is favored by astringents and styptics, such as tannic acid, iodoform, and 5 per cent solution of zinc chloride. In case of large hollow wounds that can not be dressed, such as fistulous withers, open joints, etc., antisepsis may be obtained by warm water irrigation with or without an antiseptic fluid. It should continue day and night, and never be interrupted for more than eight hours, for germs will then have gained headway and will be difficult to remove. Four or five days of irrigation will be sufficient, for granulations will then have formed and pus will remain on the outside if it forms. For permanent irrigation the stream should be very small, or drop by drop, but should play over the entire surface of the wound. It is always better to heal an infected wound under a scab, or treat it as an open wound, than it is to suture the wound, thus favoring the growth of the inclosed germs and retarding ultimate healing. In the latter case pus may develop in the wound, form pockets by sinking into the tissues, and cause various complications. Such pockets should be well drained, either through incisions at the bottom or by drainage tubes or setons. They should then be frequently syringed out or continuously irrigated. In case proud flesh appears it should be kept down either by pressure or by caustics, as powdered bluestone, silver nitrate, or by astringents, such as burnt alum. If they prove resistant to this treatment they may be removed by scissors or the knife or by searing with the hot iron. The following rules for the treatment of wounds should be followed: (1) See that the wound is clean, removing all foreign bodies. (2) For this purpose use a clean finger rather than a probe. (3) Arrest all hemorrhage before closing the wound. (4) Antiseptics should only be used if you suspect the wound to be infected. (5) When pus is present treat without closing the wound. (6) This may be accomplished by drainage tubes, absorbent dressings, setons, or continuous irrigations. (7) Protect the wound against infection while healing.

LACERATED AND CONTUSED WOUNDS.

Lacerated and contused wounds may be described together, although there is, of course, this difference, that in contused wounds there is no break or laceration of the skin. Lacerated wounds, however, are, as a rule, also contused—the surrounding tissues are bruised to a greater or lesser extent. While such wounds may not appear at first sight to be as serious as incised wounds, they are commonly very much more so. Lacerations and contusions, when extensive, are always to be regarded as dangerous. Many horses die from septic infection or mortification as a result of these injuries.

In wounds that are lacerated the amount of hemorrhage is mostly inconsiderable; even very large blood vessels may be torn apart without inducing a fatal result. The edges of the wound are ragged and uneven. These wounds are produced by barbed wire or some blunt object, as where a horse runs against fences, board piles, the corners of buildings, or where he is struck by the pole or shafts of another team, falling on rough irregular stones, etc. Contused wounds are caused by blunt instruments moving with sufficient velocity to bruise and crush the tissues, as running against objects, kicks, or falling on large, hard masses.

Treatment.—In lacerated wounds great care must at first be exercised in examining or probing to the very bottom of the rent or tear, to see if any foreign body be present. Very often splinters of wood or bits of stone or dirt are thus lodged, and unless removed prevent the wound from healing; or if it should heal the wound soon opens again, discharging a thin, gluey matter that is characteristic of the presence of some object in the part. After a thorough exploration these wounds are to be carefully and patiently fomented with warm water, to which has been added carbolic acid in the proportion of 1 part to 100 of water. Rarely, if ever, are stitches to be inserted in lacerated wounds. The surrounding tissues and skin are so weakened in vitality and structure by the contusions that stitches will not hold; they only irritate the parts. It is better to endeavor to secure coaptation by means of bandages, plasters, or collodion. One essential in the treatment of lacerated wounds is to secure a free exit for the pus. If the orifice of the wound is too high, or if pus is found to be burrowing in the tissues beneath the opening, we must then make a counter opening as low as possible. This will admit of the wound being thoroughly washed out, at first with warm water, and afterwards injected with some mild astringent and antiseptic wash, as chloride of zinc, 1 dram to a pint of water. A dependent opening must be maintained until the wound ceases to discharge. Repeated hot fomentations over the region of lacerated wounds afford much relief and should be persisted in.

BRUISES.

Bruises are nothing but contused wounds where the skin has not been ruptured. There is often considerable solution of continuity of the parts under the skin, subcutaneous hemorrhage, etc., which may result in local death and slough of the bruised parts. If the bruise or contusion is not so severe, many cases are quickly cured by constant fomentation with hot water for from two to four hours. The water should be allowed about this time to gradually become cool and then cold. Cold fomentation must then be kept up for another hour or two. Dry the parts thoroughly and quickly and bathe them freely with camphor 1 ounce, sweet oil 8 ounces, or with equal parts of lead water and laudanum. A dry, light bandage should then be applied, the horse allowed to rest, and if necessary the treatment may be repeated each day for two or three days. If, however, the wound is so severe that sloughing must ensue, we should encourage this by poultices made of linseed meal, wheat bran, turnips, onions, bread and milk, or hops. Charcoal is to be sprinkled over the surface of the poultice when the wound is bad smelling. After the slough has fallen off the wound is to be dressed with warm antiseptic washes of carbolic acid, chloride of zinc, permanganate of potash, etc. If granulating (filling up) too fast, use burnt alum or air-slaked lime. Besides this local treatment, we find that the constitutional symptoms of fever and inflammation call for measures to prevent or control them. This is best done by placing the injured animal on soft or green food. A physic of Barbados aloes, 1 ounce, should be given as soon as possible after the accident. Sedatives, such as tincture of aconite root, 15 drops, three times a day, or ounce doses of saltpeter every four hours, may also be administered. When the symptoms of fever are abated, and if the discharges from the wound are abundant, the strength of the patient must be supported by good food and tonics. One of the best tonics is as follows: Powdered sulphate of iron, powdered gentian, and powdered ginger, of each 4 ounces. Mix thoroughly and give a heaping tablespoonful twice a day, on the feed or as a drench.

PUNCTURED WOUNDS.

Punctured wounds are produced by the penetration of a sharp or blunt pointed substance, such as a thorn, fork, nail, etc., and the orifice of these wounds is always small in proportion to their depth. In veterinary practice punctured wounds are much more common than the otheis. They involve the feet most frequently, next the legs, and often the head and face from nails protruding through the stalls and trough. They are not only the most frequent, but they are also the most serious, owing to the difficulty of obtaining thorough disinfection. Another circumstance rendering them so is the lack of attention that they at first receive. The external wound is so small that but little or no importance is attached to it, yet in a short time swelling, pain, and acute inflammation, often of a serious character, are manifested.

Considering the most common of the punctured wounds, we must give precedence to those of the feet. Horses worked in cities, about iron works, around building places, etc., are most likely to receive nails in the feet. The animal treads upon nails, pieces of iron or screws, and forces them into the soles of the feet. If the nail, or whatever it is that has punctured the foot, is fast in some large or heavy body, and is withdrawn as the horse lifts his foot, lameness may last for only a few steps; but unless properly attended to at once he will be found in a day or two to be very lame in the injured member. If the foreign body remains in the foot, he gradually grows worse from the time of puncture until the cause is discovered and removed.

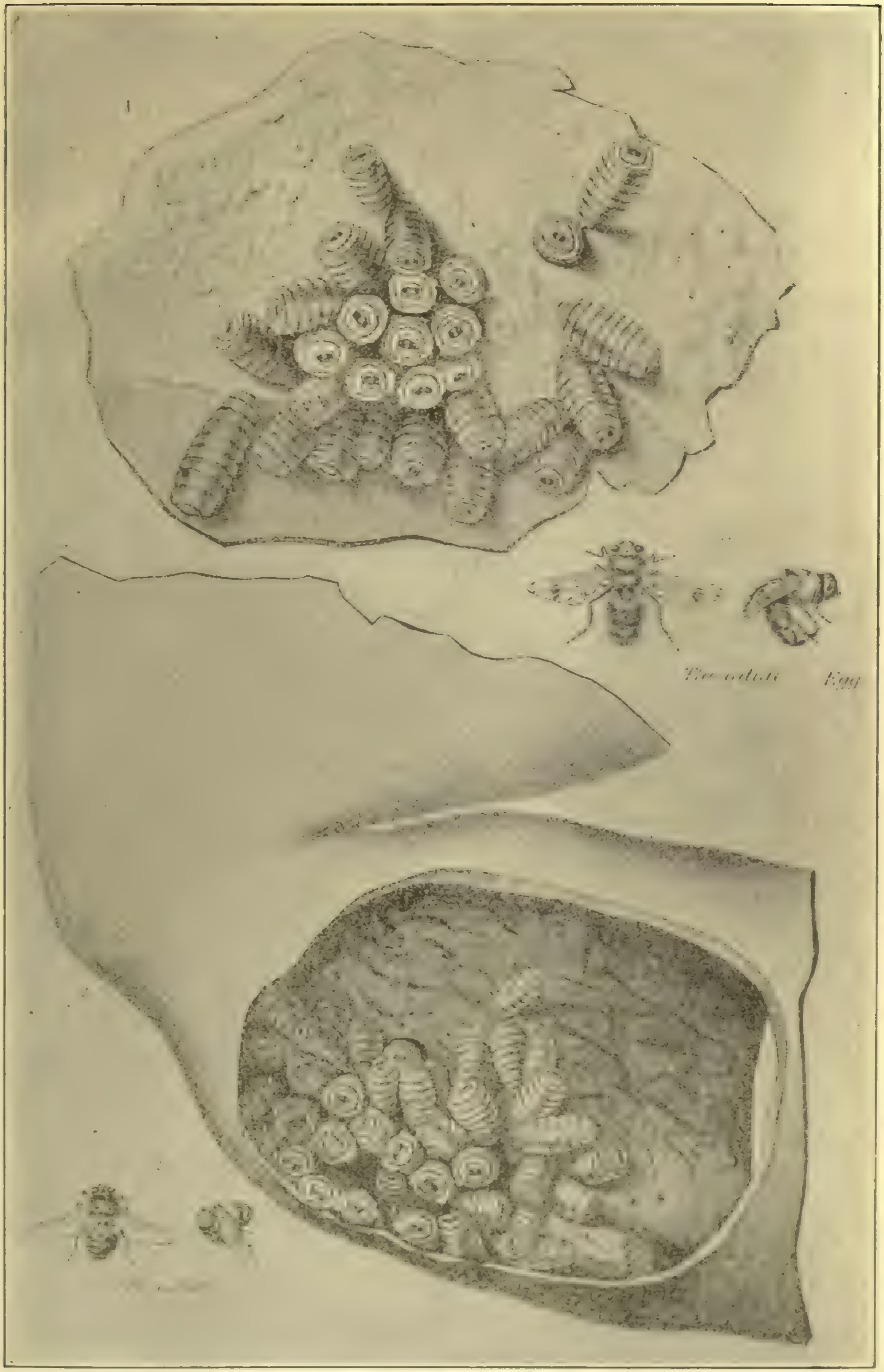
Symptoms and Treatment.—A practice which, if never deviated from—that of picking up each foot, cleaning the sole, and thoroughly examining the foot each and every time the horse comes into the stable—will enable us to reduce the serious consequences of punctured wounds of the feet to the minimum. If the wound has resulted from pricking, lameness follows soon after shoeing; if from the nails being driven too close, it usually appears from four to five days or a week after receiving the shoe. We should always inquire as to the time of shoeing, examine the shoe carefully, and see whether it has been partially pulled and the horse stepped back upon some of the nails or the clip. The pain from these wounds is lancinating; the horse is seen to raise and lower the limb or hold it from the ground altogether; often he points the foot, flexes the leg, and knuckles at the fetlock. Swelling of the fetlock and back tendons is also frequently seen and is apt to mislead us. The foot must be carefully examined, and this can not be properly done without removing the shoe. The nails should be drawn separately and carefully examined. If there is no escape of pus from the nail holes, or if the nails themselves are not moist, we must continue our examination of the foot by carefully pinching or tapping it at all parts. With a little practice we can detect the spot where pain is the greatest or discover the delicate line or scar left at the point of entrance of the foreign body. The entire sole is then to be thinned, after which we are to carefully cut down upon the point where pain is greatest upon pressure, and, finally, through the sole at this spot. When the matter has escaped, the sole, so far as it was undermined by pus, is to be removed. The foot must now be poulticed for one or two days and afterwards dressed with a compress of oakum saturated with carbolic acid solution or other antiseptic dressing.

If we discover a nail or other object in the foot, the principal direction, after having removed the offending body, is to cut away the sole, in a funnel shape, down to the sensitive parts beneath. This is imperative, and if a good free opening has been made and is maintained for a few days, hot fomentations and antiseptic dressings applied, the cure is mostly easy, simple, quick, and permanent. The horse should be shod with a leather sole under the shoe, first of all applying tar and oakum to prevent any dirt from entering the wound. In some instances nails may puncture the flexor tendons, the coffin bone, or enter the coffin joint. Such injuries are always serious, their recovery slow and tedious, and the treatment so varied and difficult that the services of a veterinarian will be necessary.

PUNCTURED WOUNDS OF JOINTS, OR OPEN JOINTS.

These wounds are more or less frequent. They are always serious, and often result in stiffening of the joint or death of the animal. The joints mostly punctured are the hock, fetlock, or knee, though other joints may, of course, suffer this injury. As the symptoms and treatment are much the same for all, only the accident as it occurs in the hock joint will be described. Probably the most common mode of injury is from the stab of a fork, but it may result from the kick of another horse that is newly shod, or in many other ways. At first the horse evinces but slight pain or lameness. The owner discovers a small wound scarcely larger than a pea, and pays but little attention to it. In a few days, however, the pain and lameness become excessive; the horse can no longer bear any weight upon the injured leg; the joint is very much swollen and painful upon pressure; there are well-marked symptoms of constitutional disturbance—quick pulse, hurried breathing, high temperature, 103° to 106° F., the appetite is lost, thirst is present, the horse reeks with sweat, and shows by an anxious countenance the pain he suffers. He may lie down, though mostly he persists in standing, and the opposite limb becomes greatly swollen from bearing the entire weight and strain for so long a time. The wound, which at first appeared so insignificant, is now constantly discharging a thin whitish or yellowish fluid—joint oil or water, which becomes coagulated about the mouth of the wound and adheres to the part in clots like jelly, or resembling somewhat the white of an egg. Not infrequently the joint opens at different places, discharging at first a thin bloody fluid that soon assumes the character above described.

Treatment.—The treatment of these wounds is most difficult. We can do much to prevent this array of symptoms if the case is seen early—within the first twenty-four or forty-eight hours after the injury; but when inflammation of the joint is once fairly established the case becomes one of grave tendencies. Whenever a punctured wound of a joint is noticed, even though apparently of but small moment, we should, without the least delay, apply a strong cantharides blister over the entire joint, being even careful to fill the orifice of the wound with the blistering ointment. This treatment is almost always effectual. It operates to perform a cure in two ways—first, the swelling of the skin and tissues underneath it completely closes the wound and prevents the ingress of air; second, by the superficial inflammation established it acts to check and abate all deep-seated inflammation. In the great majority of instances, if pursued soon after the accident, this treatment performs a cure in about one week, but should the changes described as occurring later in the joint have already taken place, we must then treat by cooling lotions and the application to the wound of a paste made up of flour and alum. A bandage is to hold these applications in place, which is only to be removed when swelling of the leg or increasing febrile symptoms demand it. In the treatment of open joints our chief aim must be to close the orifice as soon as possible. For this reason repeated probing or even injections are contraindicated. The only probing of an open joint that is to be sanctioned is on our first visit, when we should carefully examine the wound for foreign bodies or dirt, and after removing them the probe must not again be used. The medicines used to coagulate the synovial discharge are best simply applied to the surface of the wound, on pledgets of tow, and



Bots. 1. Bots in Stomach. 2. Bots in Duodenum. Horse Book, B. A. I.

held in place by bandages. Internal treatment is also indicated in those cases of open joints where the suffering is great. At first we should administer a light physic and follow this up with sedatives and anodynes, as directed for contused wounds. Later, however, we should give quinine, or salicylic acid in 1-dram doses two or three times a day.

WOUNDS OF THE TENDON SHEATHS.

Wounds of tendon sheaths are similar to open joints in that there is an escape of synovial fluid, sinew water. Where the tendons are simply punctured by a thorn, nail, or fork, we must, after a thorough exploration of the wound for any remaining foreign substance, treat with the flour-and-alum paste, bandages, etc., as for open joint. Should the skin and tendons be divided the case is even more serious and often incurable. There is always a large bed of proud flesh at the seat of injury, and a thickening more or less pronounced remains. When the back tendons of the leg are severed we should apply at once a high-heel shoe (which is to be gradually lowered as healing advances) and bandage firmly with a compress moistened with a 10-grain chloride of zinc solution. When proud flesh appears this is best kept under control by repeated applications of a red-hot iron. Mares that are valuable as brood animals and stock horses should always be treated for this injury, as, even though blemished, their value is not seriously impaired. The length of time required and the expense of treatment will cause us to hesitate in attempting a cure, if the subject is old and comparatively valueless.

GUNSHOT WOUNDS.

These wounds vary in size and character, depending on the size and quality of the projectile and also the tissue injured. They are so seldom met with in our animals that an extended reference to them seems unnecessary. If a wound has been made by a bullet a careful examination should be made to ascertain if the ball has passed through or out of the body. If it has not we must then probe for the ball, and if it can be located it is to be cut out when practicable to do so. Oftentimes a ball may be so lodged that it can not be removed, and it then may become encysted and remain for years without giving rise to any inconvenience. It is often difficult to locate a bullet, as it is very readily deflected by resistances met with after entering the body.

The entering wound is the size of the projectile, the edges are inverted and often scorched. The wound produced in case of the bullet's exit is larger than the projectile, the edges are turned out and ragged. A bullet heated by the friction of the barrel or air often softens and becomes flattened on striking a bone or other tissue. Modern bullets that have an outer steel layer may pass through bone without splintering it. Leaden bullets may split, producing two exit wounds. Spent bullets may only produce a bruise. Should bones be struck by a ball they are sometimes shattered and splintered to such an extent as to warrant us in having the animal destroyed. A gunshot wound, when irreparable injury has not been done, is to be treated the same as punctured wounds, *i. e.,* stop the hemorrhage, remove the foreign body if possible, and apply hot fomentations or poultices to the wound until suppuration is fairly established. Antiseptic and disinfectant injections may then be used. Should pus accumulate in the tissues, openings must be made at the most depending parts for its escape. Wounds from shotguns fired close to the animals are serious. They are virtually lacerated and contused wounds. Remove all the shot possible from the wound, and treat as directed for contusions. When small shot strike the horse from a distance they stick in the skin or only go through it. The shot grains must be picked out, but as a rule this peppering of the skin amounts to but little.

POISONED WOUNDS.

These injuries are the result of bites of snakes, rabid dogs, stings of bees, wasps, etc. A single sting is not dangerous, but an animal is often stung by a swarm of insects, when the chief danger occurs from the swelling produced. If stung about the head, the nostrils may be closed as a result of the swelling, causing labored breathing and possibly asphyxiation. Intoxication may be produced by the absorption of this poison and is manifested by staggering gait, spreading of the legs, paralysis of the muscles, difficult respiration, and a rise of temperature. Death may follow in five to ten hours.

Treatment.—Douse animal with cold water and apply any alkaline liquid, such as soapsuds, bicarbonate of soda, or weak solution of ammonia. Internally give alcohol, ether, or camphor to strengthen the heart. In case of bites by rattlesnakes, moccasin, or other poisonous snakes, a painful swelling occurs about the bitten part, which is followed by labored breathing, weakness, retching, fever, and death from collapse. The animal usually recovers if it can be kept alive over the third day. In treating the animal, a tight ligature should be passed about the part above the wound to keep the poison from entering the general circulation. Wash out the wound thoroughly with antiseptics and then apply a caustic, or burn with a hot instrument. Cold water may be applied to the wound to combat the inflammation. Bites of rabid dogs produce an infected wound, and the virus of rabies introduced in this manner should be removed or destroyed in the wound. Therefore produce considerable bleeding by incising the wound, wash out thoroughly with 10 per cent solution of zinc chloride, and then apply caustics or the actual cautery.

HARNESS GALLS (SITFASTS).

Wounds or abrasions of the skin are frequently caused by ill-fitting harness or saddles. When a horse has been resting from steady work for some time, particularly after being kept idle in a stable on a scanty allowance of grain, as in winter, he is soft and tender and sweats easily when put to work again. In this condition he is apt to sweat and chafe under the harness, especially if it is hard and poorly fitted. This chafing is likely to cause abrasions of the skin, and thus pave the way for an abscess, or for a chronic blemish, unless attended to very promptly. Besides causing the animal considerable pain, chafing, if long continued, leads to the formation of a callosity. This may be superficial, involving only the skin, or it may be deep-seated, involving the subcutaneous fibrous tissue and sometimes the muscle and even the bone. This causes a dry slough to form, which is both inconvenient and unsightly. Sloughs of this kind are commonly called sitfasts and, while they occur in other places, are most frequently found under the saddle.

Treatment.—Abrasions are best prevented by bringing the animal gradually into working shape after it has had a prolonged rest, in order that the muscles will be hard and the skin tough. The harness should be well fitted, neither too large nor too small, and it should be cleaned and oiled to remove all dirt and to make it soft and pliable. Saddles should be properly fitted so as to prevent direct pressure on the spine, and the saddle blankets should be clean and dry. Parts of the horse where chafing is likely to occur, as on the back under the saddle, should be cleaned and brushed free of dirt.

The remedies for simple harness galls are numerous. Among them may be mentioned alcohol, 1 pint, in which are well shaken the whites of two eggs; sugar of lead or sulphate of zinc, 20 grains to an ounce of water; carbolic acid, 1 part in 15 parts of glycerin, and so on almost without end. Any simple astringent wash or powder will effect a cure, provided the sores are not irritated by friction.

If a sitfast has developed, the dead hornlike slough must be carefully dissected out and the wound treated carefully with antiseptics. During treatment it is always best to allow the animal to rest, but if this is inconvenient care should be taken to prevent injury to the abraded or wounded surface by padding the harness so that chafing can not occur.

BURNS AND SCALDS.

These wounds of domestic animals are fortunately of rare occurrence; however, when they do occur, if at all extensive, they prove quite troublesome and in many cases are fatal. According to the severity of the burn we distinguish three degrees: First degree, where there is a simple reddening of the skin; second degree, where there is a formation of vesicles, or blisters; third degree, where there is complete destruction of vitality of the tissues, such as would occur in charring from direct contact with flames or from escaping steam. Besides the burns caused by flames and steam, there are other causative agents, such as chemicals (caustic alkalis and acids), lightning stroke, and occasionally the broken trolley wires of electric railways. When a large surface of the skin is burned or scalded, the animal will soon show signs of fever—shivering, coldness of the extremities, weakness, restlessness, quick and feeble pulse, and labored breathing. No matter which agent is a factor in the production of burns, the lesions are practically of the same nature. The extent and site of the burn should lead one in the determination and course of treatment. Burns of the shoulder and those about the region of the elbow or other parts where there is much movement of the tissues are grave, and, if at all extensive, treatment should not be attempted, but the immediate destruction of the animal is advised. A burn of the third degree, where there is a destruction of the vitality of large areas of tissue, even on parts not subject to much motion, is extremely tedious to treat; in fact, it is questionable whether the treatment and keep of the animal will ever be compensated for, even though recovery does take place, which, in any event, will require at least six or eight weeks. Those due to lightning stroke and trolley wires are likely to occur in irregular lines, and, unless death occurs at once, they are not likely to prove serious.

Treatment.—Treatment should be prompt and effective. If the burns are extensive the constitutional symptoms should be combated with whisky and milk and eggs, or ammonia carbonate, strychnine, caffein, and other stimulants to prevent shock. In the local treatment, to alleviate the pain, the application of cold water in some form and the hypodermic injection of morphine are to be recommended. In burns of the first degree, where there is only a superficial inflammation, white lead ointment is very good. Carron oil (limewater and linseed oil, equal parts) is a standard remedy, but a modification of it known as Stahl's liniment is perhaps better; this liniment is composed of linseed oil and limewater each 200 parts, bicarbonate soda 100 parts, and thymol 1 part. This liniment should be applied freely to the scorched surface and covered with a layer of borated gauze or absorbent cotton to protect it from the air. Renew the application frequently. Carbolated vaseline may be used in place of the above. In case the burn is more extensive, the following solution may be used: Picric acid 2 parts, alcohol 40 parts, water 400 parts. The lesion should be thoroughly cleansed with this solution used on absorbent cotton. Strips of gauze or absorbent cotton saturated with the solution should now be applied and renewed only occasionally. In burns of the second and third degrees more satisfactory results may be obtained with nonpoisonous dry dressing powder, such as is used in ordinary open wounds, as tannic acid 8 parts and iodoform 1 part, or a salve made of this powder and a sufficient quantity of vaseline. When sloughing of the tissues takes place the wounds should be cleansed with a 3 per cent solution of carbolic acid, all loose fragments of tissue removed, and either a dry antiseptic dressing powder or carbolated vaseline ointment applied to exclude the air. Proud flesh should be controlled by the application of silver nitrate in the form of a caustic pencil.

Burns due to mineral acids may be first treated by flushing the parts with a copious quantity of cold water or by the application of whiting or chalk. Either use a large quantity of water at the start or use the chalk first, then wash with water. If the irritant has been a caustic alkali, such as potash, lye, ammonia, or soda, then vinegar should be the first application. Stahl's liniment is probably the best general application for all burns for the first week; then this should be followed by the ordinary antiseptic wound dressings.

GANGRENE.

Gangrene, or mortification, denotes the death of the affected part, and is mostly found attacking soft tissue near the surface of the body. Gangrenous areas may occur as a result of shutting off their blood supply. Constitutional diseases, such as anthrax, and septicema, predispose to gangrene. As external causes we have acids and alkalis, freezing and burning, contusions and continuous pressure that interrupt the circulation. There are two forms of gangrene—dry and moist. Dry gangrene is most often seen in horses from continuous lying down or from uneven pressure of some portion of the harness.

Symptoms.—There is a lack of sensation due to the death of nerves. In dry gangrene the skin is leathery and harsh, while in moist gangrene the tissues are soft, wrinkled, and friable; the hair is disturbed, and the skin is usually moist and soapy and sometimes covered with blebs. The tissue surrounding the moist gangrenous patch is usually inflamed, swollen, and hot, but this is less noticeable in the case of dry gangrene. Moist gangrene often spreads and involves deeper tissue, sheaths of tendons and joints producing septic synovitis or septic arthritis leading to pyemia and death. Dry gangrene is seldom dangerous, but the rapidity of its spread will indicate its virulence.

Treatment.—The preventive treatment consists in avoiding all the influences that tend to disturb the nutrition of the tissues, such as excessive cold or heat or continuous pressure. Gangrene following decubitis may be prevented by using soft bedding and frequently turning the animal from one side to the other. In dry gangrene moist heat in the form of poultices or anointing the tissue with oils and fats will be found beneficial in hastening the dead tissue to slough off. When the outer skin begins to suppurate, seize it with a pair of pincers and draw it away. After this treat the patch as an open wound. In moist gangrene the tissue should be thoroughly disinfected with creolin, or particularly an alcoholic tincture of camphor. Continuous irritation with antiseptic fluids prevents the accumulation and absorption of poisonous liquids. Incisions into the dead tissue may be made, and when sloughing commences the tissue should be removed with forceps and the resulting wound treated as in dry gangrene.

ULCERATION.

An ulcer is a circumscribed area of necrosis occurring on the skin or mucous membrane and covered with granulation tissue. It is a process of destruction, and when this process is going on faster than regeneration can take place, we have a gnawing, or eating, ulcer. When such an ulcer increases rapidly in size it is termed a phagedenic ulcer. A fungoid ulcer is one in which the bottom of the ulcer projects beyond the edge of the skin. These ulcers secrete milky or bloody-white liquid called ichor. When the ulcer is of an ashen or leaden color, with the bottom and sides formed of dense, hard connective tissue which gives but little discharge and is not sensitive, it is termed callous, torpid, or indolent ulcer.

Causes.—As in the case of gangrene, disturbances of circulation are among the most frequent causes. A wound to a tissue with slight recuperative power may be followed by ulceration, as in tumors. Certain germs may produce ulcers, as the glanders bacilli, which cause the ulcerations on the nasal septum in glanders.

Treatment.—This consists in removing at once the exciting cause. The secretions of the ulcers should be washed off with antiseptic solutions and the formation of granulation tissues stimulated by antiseptic salves, such as carbolated vaseline, lead ointment, or by dressings of camphor. Air should be kept from the ulcer by occlusive dressings. Where the ulcers are inflamed, warm lead water or lead water and laudanum will be found efficacious. Callous ulcers are best removed by a curet, knife, or hot iron and then treated like a common wound. Mechanical irritation should be avoided.

ABSCESSES.

These consist of accumulations of pus within circumscribed walls, at different parts of the body, and may be classed as acute, and cold, or chronic, abscesses. When an abscess occurs about a hair follicle it is called a boil or furuncle; when several hair follicles are involved, resulting in the formation of more than one exit for the inflammatory products, it is called a carbuncle.

ACUTE ABSCESSES.

Acute abscesses follow as the result of local inflammation in glands, muscular tissue, or even bones. They are very common in the two former. The abscesses most commonly met with in the horse (and the ones which will be here described) are those of the salivary glands, occurring during the existence of strangles, or colt distemper. The glands behind or under the jaw are seen to slowly increase in size, becoming firm, hard, hot, and painful. At first the swelling is uniformly hard and resisting over its entire surface, but in a little while becomes soft at some portion, mostly in the center. From this time on the abscess is said to be pointing, or coming to a head, which is shown by a small elevated or projecting prominence, which at first is dry, but soon becomes moist with transuded serum. The hairs over this part loosen and fall off, and in a short time the abscess opens, the contents escape, and the cavity gradually fills up.

Abscesses in muscular tissue are usually the result of bruises or injuries. In all cases where abscesses are forming we should hurry the ripening process by frequent hot fomentations and poultices. When they are very tardy in their development a blister over their surface is advisable. It is a common rule with surgeons to open an abscess as soon as pus can be plainly felt, but this practice can scarcely be recommended to owners of stock indiscriminately, since this little operation frequently requires an exact knowledge of anatomy. It will usually be found the better plan to encourage the full ripening of an abscess and allow it to open of itself. This is imperative if the abscess is in the region of joints, etc. When open, we must not squeeze the walls of the abscess to any extent. They may be very gently pressed with the fingers at first to remove the pus, but after this the orifice is simply to be kept open by the introduction of a clean probe, should it be disposed to heal too soon. If the opening is at too high a level another should be made into the lowest portion of the abscess so as to permit the most complete drainage. Hot fomentations or poultices are sometimes required for a day or two after an abscess has opened, and are particularly indicated when the base of the abscess is hard and indurated.

The cavity should be thoroughly washed with stimulating antiseptic solutions, such as 3 per cent solution of carbolic acid, 3 to 5 per cent solution of creolin, 1 to 1,000 bichloride of mercury, or 1 per cent permanganate of potash solution. If the abscesses are foul and bad smelling, their cavities should first be syringed with 1 part of hydrogen peroxide to 2 parts of water and then followed by the injection of any of the above-mentioned antiseptics.

COLD ABSCESSES.

Cold abscess is the term applied to those large, indolent swellings that are the result of a low, or chronic, form of inflammation, in the center of which there is a small collection of pus. They are often seen near the point of the shoulder, forming the so-called breast boil. The swelling is diffuse and of enormous extent, but slightly hotter than surrounding parts, and not very painful upon pressure. There is a pronounced stiffness, rather than pain, evinced upon moving the animal. Such abscesses have the appearance of a hard tumor, surrounded by a softer edematous swelling, involving the tissues to the extent of a foot or more in all directions from the tumor. This diffused swelling gradually subsides and leaves the large, hardened mass somewhat well defined. One of the characteristics of cold abscesses is their tendency to remain in the same condition for a great length of time. There is neither heat nor soreness; no increase nor lessening in the size of the tumor. If, however, the animal should be put to work for a short time the irritation of the collar causes the surrounding tissues to again assume an edematous condition, which after a few days' rest disappears, leaving the tumor as before or but slightly larger. Upon careful manipulation we may discover what appears to be a fluid deep seated in the center of the mass. The quantity of matter so contained is very small—often not more than a tablespoonful—and for this reason it can not, in all cases, be detected.

Cold abscesses are mostly, if not always, caused by the long-continued irritation of a loose and badly fitting collar. There is a slow inflammatory action going on, which results in the formation of a small quantity of matter inclosed in very thick and but partially organized walls, that are not as well defined as is the circumference of fibrous tumors, which they most resemble.

Treatment.—The means recommended to bring the acute abscess to a head are but rarely effectual with this variety; or, if successful, too much time has been occupied in the cure. We must look for other and more rapid methods of treatment. These consist, first of all, in carefully exploring the tumor for the presence of pus. The incisions must be made over the softest part and carried deep into the tumor (to its very bottom if necessary), and the matter allowed to escape. After this, and whether we have found matter or not, we must induce an active inflammation of the tumor in order to promote solution of the thick walls of the abscess. This may be done by inserting well into the incision a piece of oakum or cotton saturated with turpentine, carbolic acid, tincture of iodine, etc., or we may pack the incision with powdered sulphate of zinc and keep the orifice plugged for twenty-four hours. These agents set up a destructive inflammation of the walls. Suppuration follows, and this should now be encouraged by hot fomentations and poultices. The orifice must be kept open, and should it be disposed to heal we must again introduce some of the agents above described. A favored treatment with many, and it is probably the best, is to plunge a red-hot iron to the bottom of the incision and thoroughly sear all parts of the walls of the abscess. This is to be repeated after the first slough has taken place, if the walls remain thickened and indurated.

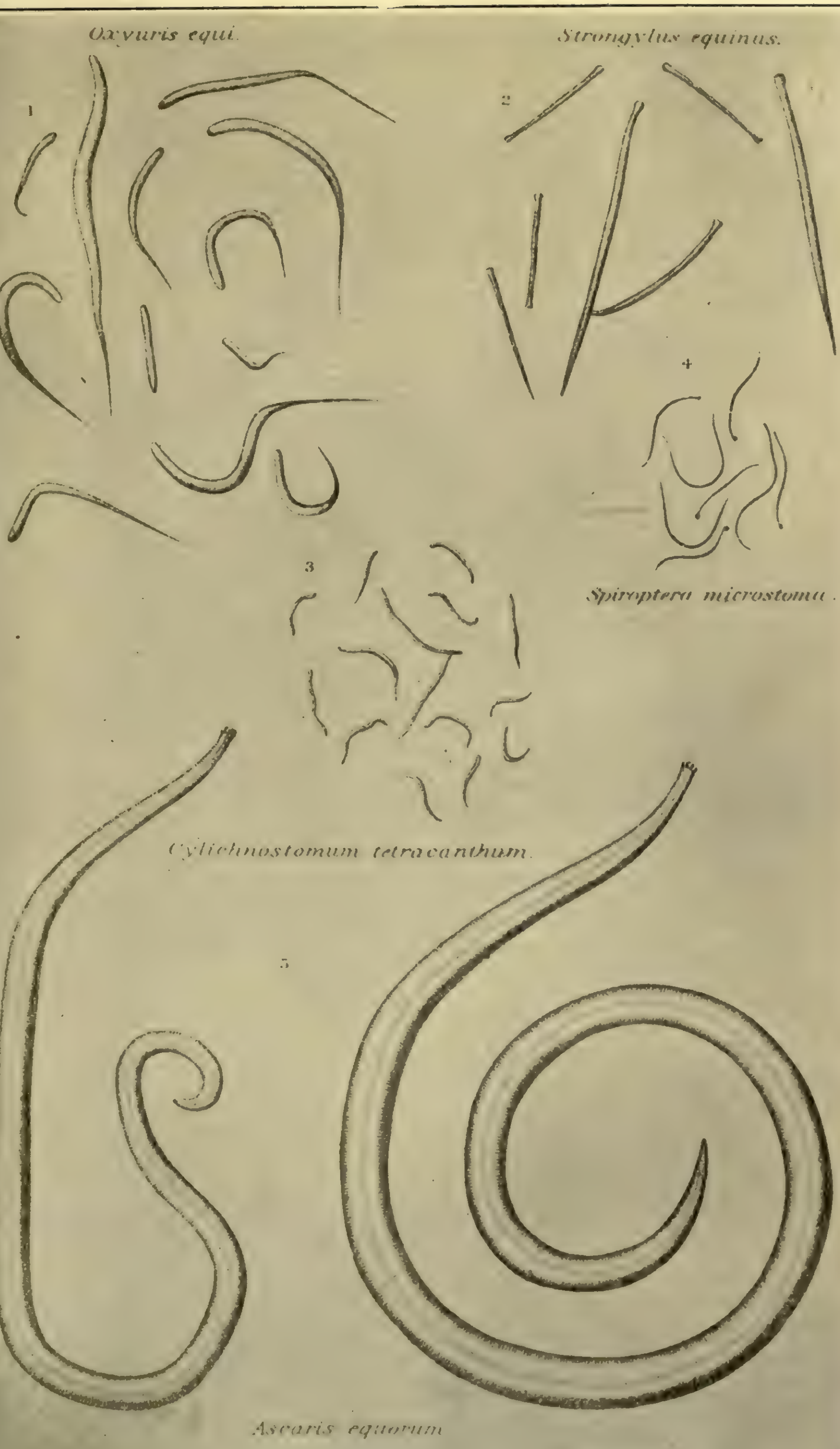
It is useless to waste time with fomentations, poultices, or blisters in the treatment of cold abscesses, since, though apparently removed by such methods, they almost invariably return when the horse is put to work. If treated as above directed, and properly fitted with a good collar after healing, there will not remain any track or trace of the large, unsightly mass.

FISTULAS.

The word fistula is applied to any ulcerous lesion upon the external surface of the body which is connected by ducts, or passages, with some internal cavity. Because of this particular formation the term fistulous tract is often used synonymously with the word fistula. Fistulas may exist in any part of the body, but the name has come to be commonly accepted as applicable only to such lesions when found upon the withers. Poll evil is a fistula upon the poll, and in no sense differs from fistulous withers except in location. The description of fistula will apply, then in the main, to poll evil equally well. Quittor presents the characteristic tubular passages of a fistula and may therefore be considered and treated as fistula of the foot. Fistulous passages may also be developed upon the sides of the face, through which saliva is discharged instead of flowing into the mouth, and are called salivary fistulas. A dental fistula may arise from the necrosis of the root of a tooth. Again, a fistula is sometimes noted at the umbilicus associated with hernia, and recto-vaginal fistulas have been developed in mares, following difficult parturition. Fistulas may arise from wounds of glandular organs or their ducts, and thus we have the so-called mammary, or lachrymal, fistulas.

Fistulous tracts are lined with a false, or adventitious, membrane and show no disposition to heal. They constantly afford means of exit to the pus or ichorous material discharged by the unhealthy parts below. They are particularly liable to develop at the withers or poll because of the exposed positions which these parts occupy, and, having once become located there, they usually assert a tendency to further extension, because the vertical and laminated formation of the muscles and tendons of these parts allows the forces of gravitation to assist the pus in gaining the deeper lying structures and also favors its retention among them.

Causes.—Fistulas follow as a result of abscesses, bruises, wounds, or long-continued irritation by the harness. Among the more common causes of fistula of the poll (poll evil) are chafing by the halter or heavy bridle; blows from the butt end of the whip; the horse



INTESTINAL WORMS.

striking his head against the hayrack, beams of the ceiling, low doors, etc. Fistulous withers are seen mostly in those horses that have thick necks as well as those that are very high in the withers; or, among saddle horses, those that are very low on the withers, the saddle here riding forward and bruising the parts. They are often caused by bad-fitting collars or saddles, by direct injuries from blows, and from the horse rolling upon rough or sharp stones. In either of these locations ulcers of the skin, or simple abscesses, if not properly and punctually treated, may become fistulas. The pus burrows and finds lodgment deep down between the muscles, and escapes only when the sinus becomes surcharged, or when, during motion of the parts, the matter is forced to the surface.

Symptoms.—These, of course, will vary according to the progress made by the fistula. Following an injury we may often notice soreness or stiffness of the front legs, and upon careful examination of the withers we will see small lines running from the point of irritation downward and backward over the region of the shoulder. These are superficial lymphatics, and are swollen and painful to the touch. In a day or two a swelling is noticed on one or both sides of the dorsal vertebræ, which is hot and painful and rapidly enlarging. The stiffness of the limbs may disappear at this time, and the heat and soreness of the parts may become less noticeable, but the swelling remains and continues to enlarge.

A fistulous ulcer of the poll may be first indicated by the opposition which the animal offers to the application of stable brush or bridle. At this time the parts are so sore and sensitive that there is some danger that the patient will acquire disagreeable stable habits unless handled with the greatest care. The disease in its early stages may be recognized as a soft tumor, with the presence of stiffness of the neck. Later the inflammation of the surrounding tissues may disappear, leaving a prominent tumor. The swelling, whether situated upon the head or the withers, may open and form a running ulcer, or its contents may dry up and leave a tumor which gradually develops the common characteristics of a fibrous tumor. When the enlargement has opened we should carefully examine its cavity, as upon its condition will wholly depend our treatment.

Treatment.—In the earliest stage, when there is soreness, enlarged lymphatics, but no well-marked swelling, the trouble may frequently be aborted. To do this requires both general and local treatment. A physic should be given, and the horse receive 1 ounce of powdered saltpeter three times a day in his water or feed. If the fever runs high, 20-drop doses of tincture of aconite root every two hours may be administered. The local application of cold water to the inflamed spot for an hour at a time three or four times a day has often proved very beneficial, and has afforded great relief to the patient.

Cooling lotions, muriate of ammonia, or saltpeter and water; sedative washes, such as tincture of opium and aconite, chloroform liniment, or camphorated oil, are also to be frequently applied. Should this treatment fail to check the progress of the trouble, the formation of pus should be hastened as rapidly as possible. Hot fomentations and poultices are to be constantly used, and as soon as the presence of pus can be detected, the abscess wall is to be opened at its lowest point. In this procedure lies our hope of a speedy cure. As with any simple abscess, if drainage can be so provided that the pus will run off as fast as formed, the healing which follows will be rapid and satisfactory.

Attention is again called to the directions given above as to the necessity of probing the cavity when opened. If upon a careful examination with the probe we find that there are no pockets, but a simple, regular abscess wall, the indications for treatment is to make an opening from below so that the matter must all escape. Rarely is anything more needed than to keep the orifice open and to bathe or inject the parts with some simple antiseptic wash that is a nonirritant. A low opening and cleanliness constitute the essential and rational treatment.

If the abscess has already opened, giving vent to a quantity of purulent matter, and the pipes and tubes leading from the opening are found to be extensive and surrounded with thick membranes, there is considerable danger that the internal ligaments or even some of the bones have become affected, in which case the condition has assumed a serious aspect. Or, on the other hand, if the abscess has existed for some time without a rupture, its contents will frequently be found to consist of dried purulent matter, firm and dense, and the walls surrounding the mass will be found greatly thickened. In such a case we must generally have recourse to the application of caustics which will cause a sloughing of all of the unhealthy tissue, and will also stimulate a rapid increase of healthy organized material to replace that destroyed in the course of the development and treatment of the disease. Threads or cords soaked in gum arabic solution and rolled in powdered corrosive sublimate may be introduced into the canal and allowed to remain. The skin on all parts of the shoulder and leg beneath the fistula should be carefully greased with lard or oil, as this will prevent the discharge that comes from the opening after the caustic is introduced from irritating or blistering the skin over which it flows. In obstinate cases a piece of caustic potash (fused) 1 to 2 inches in length may be introduced into the opening and should be covered with oakum or cotton. The horse should then be secured so that he can not reach the part with his teeth. After the caustic plug has been in place for twenty-four hours, it may be removed and hot fomentations applied. As soon as the discharge has become again established the abscess should be opened from its lowest extremity, and the passage thus formed may be kept open by the introduction of a seton. If the pipes become established in the deep tissues beneath the shoulder blade or among the spines of the vertebral column, it will often be found impossible to provide proper drainage for the abscess from below, and treatment must consist of caustic solutions carefully injected into all parts of the suppurating sinuses. A very effective remedy for this purpose consists of 1 ounce of chloride of zinc in half a pint of water, injected three times during a week, after which a weak solution of the same may be occasionally injected. Injections of corrosive sublimate, strong carbolic acid, or possibly oil of turpentine will also prove beneficial. Pressure should be applied from below, and endeavors made to heal the various pipes from the bottom.

Should the swelling become general, without forming a well-defined tumor, the placing of 20 to 30 grains of arsenious acid wrapped in a single layer of tissue paper, in a shallow incision beneath the skin will often produce a sloughing of the affected parts in a week or ten days, after which the formation of healthy tissue follows. The surrounding parts of the skin should be protected from any damage from escaping caustics by the application of lard or oil, as previously suggested.

Although the successful treatment of fistulas requires time and patience, the majority of the cases are curable. The sinuses must be opened at their lowest extremity and kept open. Caustic applications must be thoroughly used once or twice, after which mild astringent antiseptic washes should be persistently used until a cure is reached. It sometimes happens that the erosions have burrowed so deeply or in such a direction that the opening of a drainage passage becomes impracticable. In other cases the bones may become attacked in some inaccessible location, or the joints may be affected, and in these cases it is often best to destroy the horse at once.

The reappearance of the fistula after it has apparently healed is not uncommon. The secondary attack in these cases is seldom serious. The lesion should be carefully cleansed and afterwards injected with a solution of zinc sulphate, 20 grains to the ounce of water, every second or third day until a cure is effected.

In fistula of the foot we see the same tendency toward the burrowing of pus downward to lower structures, or in some cases upward toward the coronet. Prior to the development of a quittor there is always swelling at the coronet, accompanied by heat and pain. Every effort should now be made to prevent the formation of an abscess at the point of injury. Wounds caused by nails, gravel, or any other foreign body which may have become lodged in the sole of the foot should be opened at once from below so as to allow free exit to all purulent discharges. Should the injury have occurred directly to the coronet the application of cold fomentations may prove efficient in preventing the formation of an abscess.

When a quittor becomes fully established it should be treated precisely as a fistula situated in any other part of the body; that is, the sinuses should all be opened from their lowest extremities so as to afford constant drainage. All fragments of diseased tissue should be trimmed away, antiseptic solutions injected, and, after covering the wound with a pad of oakum saturated with some good antiseptic wash, the whole foot may be carefully covered with clean bandages, which will afford valuable assistance to the healing process by excluding all dirt from the affected part.—(Spl. Rpt. Horse, Dept. Agr. 1911; La. E. S. B. 15.)

DISEASES OF THE URINARY ORGANS.

USES OF THE URINARY ORGANS.

The urinary organs constitute the main channel through which are excreted the nitrogenous or albuminoid principles, whether derived directly from the food or from the muscular and other nitrogenized tissues of the body. They constitute, besides, the channel through which are thrown out most of the poisons, whether taken in by the mouth or skin or developed in connection with faulty or natural digestion, blood-forming, nutrition, or tissue destruction; or, finally, poisons that are developed within the body, as the result of normal cell life or of the life of bacteria or other germs that have entered the body from without. Bacteria themselves largely escape from the body through the kidneys. To a large extent, therefore, these organs are the sanitary scavengers and purifiers of the system, and when their functions are impaired or arrested the retained poisons quickly show their presence in resulting disorders of the skin and connective tissue beneath it, of the nervous system, or other organs. Nor is this influence one-sided. Scarcely an important organ of the body can suffer derangement without entailing a corresponding disorder of the urinary system. Nothing can be more striking than the mutual balance maintained between the liquid secretions of the skin and kidneys during hot and cold weather. In summer, when so much liquid exhales through the skin as sweat, comparatively little urine is passed, whereas in winter, when the skin is inactive, the urine is correspondingly increased. This vicarious action of skin and kidneys is usually kept within the limits of health, but at times the draining off of the water by the skin leaves too little to keep the solids of the urine safely in solution, and these are liable to crystallize out and form stone and gravel. Similarly the passage in the sweat of some of the solids that normally leave the body, dissolved in the urine, serves to irritate the skin and produce troublesome eruptions.

PROMINENT CAUSES OF URINARY DISORDERS.

A disordered liver contributes to the production, under different circumstances, of an excess of biliary coloring matter, which stains the urine; of an excess of hippuric acid and allied products, which being less soluble than urea (the normal product of tissue change), favor the formation of stone, of taurocholic acid, and other bodies that tend, when in excess, to destroy the blood globules and to cause irritation of the kidneys by the resulting hemoglobin excreted in the urine, and of glycogen too abundant to be burned up in the system, which induces diabetes. Any disorder leading to impaired functional activity of the lungs is causative of an excess of hippuric acid and allied bodies, of oxalic acid, of sugar, etc., in the urine, which irritate the kidneys even if they do not produce solid deposits in the urinary passages. Diseases of the nervous system, and notably of the base of the brain and of the spinal cord, induce various urinary disorders, prominent among which is diabetes. In all extensive inflammations and acute fevers the liquids of the urine are diminished, while the solids (waste products), which should form the urinary secretion, are increased, and the surcharged urine proves irritant to the urinary organs or the retained waste products poison the system at large.

Diseases of the heart and lungs, by interfering with the free onward flow of the blood from the right side of the heart, tend to throw that liquid back on the veins, and this backward pressure of venous blood strongly tends to disorders of the kidneys. Certain poisons taken with the food and water, notably that found in magnesian limestone and those found in irritant plants, are especially injurious to the kidneys. The kidneys may be irritated by feeding green vegetables covered with hoar frost or by furnishing an excess of food rich in phosphates (wheat bran, beans, pease, vetches, lentils, rape cake, cotton-seed cake) or by a privation of water, which entails a concentrated condition and high density of the urine. Exposure in cold rain or snow storms, cold drafts of air, and damp beds are liable to further disorder an already overworked or irritable kidney. Finally, sprains of the back and loins may cause bleeding from the kidneys or inflammation.

The bladder is a reservoir for the retention of the urine until the discomfort of its presence causes its voluntary discharge. It is kept closed by circular muscular fibers surrounding its neck or orifice, and is emptied by looped muscular fibers extending in all directions forward from the neck around the blind anterior end of the sac. From the bladder the urine escapes through a dilatable tube which extends from the neck of the bladder backward on the floor of the pelvis, and in the male through the penis to its free end. In the mare the urethra is not more than an inch in length, and is surrounded by the circular muscular fibers closing the neck of the bladder. Its opening may be found directly in the median line of the floor of the vulva, about 4½ inches from its external opening.

GENERAL SYMPTOMS OF DISEASE.

These apply especially to acute inflammations and the irritation caused by stone. The animal moves stiffly on the hind limbs, straddles, and makes frequent attempts to pass urine, which may be in excess, deficient in amount, liable to sudden arrest in spite of the straining, passed in driblets, or entirely suppressed. Again, it may be modified in density or constituents. Difficulty in making a sharp turn, or in lying down and rising with or without groaning, dropping the back when mounted or when pinched on the loins is suggestive of kidney disease, and so to a less extent are swelled legs, dropsy, and diseases of the skin and nervous system. The oiled hand introduced through the rectum may feel the bladder beneath and detect any overdistention, swelling, tenderness, or stone. In ponies the kidneys even may be reached.

EXAMINATION OF THE URINE.

In some cases the changes in the urine are the sole sign of disease. In health the horse's urine is of a deep amber color and has a strong odor. On a feed of grain and hay it may show a uniform transparency, while on a green ration there is an abundant white deposit of carbonate of lime. Of its morbid changes the following are to be looked for: (1) *Color:* White from deposited salts of lime; brown or red from blood clots or coloring matter; yellow or orange from bile or blood pigment; pale from excess of water; or variously colored from vegetable ingredients (santonin makes it red; rhubarb or senna, brown; tar or carbolic acid, green). (2) *Density:* The horse's urine may be 1.030 to 1.050, but it may greatly exceed this in diabetes and may sink to 1.007 in diuresis. (3) *Chemical reaction,* as ascertained by blue litmus or red test papers. The horse on vegetable diet has alkaline urine turning red test papers blue, while in the sucking colt and the horse fed on flesh or on his own tissues (in starvation or abstinence during disease) it is acid, turning blue litmus red. (4) *Organic constituents,* as when glairy from albumen coagulable by strong nitric acid and boiling, when charged with microscopic casts of the uriniferous tubes, with the eggs or bodies of worms, with sugar, blood, or bile. (5) *In its salts,* which may crystallize out spontaneously, or on boiling, or on the addition of chemical reagents.

Albuminous urine in the horse is usually glairy, so that it may be drawn out in threads, but its presence can always be tested as follows: If the liquid is opaque, it may be first passed through filter paper; if very dense and already precipitating its salts, it may be diluted with distilled water; add to the suspected liquid acetic acid drop by drop until it reddens the blue litmus paper; then boil gently in a test tube; if a precipitate is thrown down, set the tube aside to cool and then add strong nitric acid. If the precipitate is not dissolved, it is albumen; if dissolved it was probably urate of ammonia. Albumen is normally present in advanced gestation; abnormally it is seen in diseases in which there occurs destruction of blood globules (anthrax, low fevers, watery states of the blood, dropsies), in diseases of the heart and liver which prevent the free escape of blood from the veins and throw back venous pressure on the kidneys, in inflammation of the lungs and pleuræ, and even bloating, doubtless from the same cause, and in all congestive or inflammatory diseases of the kidneys, acute or chronic.

Casts of the uriniferous tubes can only be seen by placing the suspected urine under the microscope. They are usually very elastic and mobile, waving about in the liquid when the cover-glass is touched, and showing a uniform clear transparency or entangled circular epithelial cells or opaque granules or flattened red-blood globules or clear refrangent oil globules. They may be even densely opaque from crystals of earthy salts. Pus cells may be found in the urine associated with albumen, and are recognized by clearing up, when treated with acetic acid, so that each cell shows two or three nuclei.

DIURESIS, OR EXCESSIVE SECRETION OF URINE.

This consists in an excessive secretion of a clear, watery urine of a low specific gravity (1.007) with a correspondingly ardent thirst, a rapidly advancing emaciation, and great loss of strength and spirit.

Causes.—Its causes may be any agent—medicinal, alimentary, or poisonous—which unduly stimulates the kidneys; the reckless administration of diuretics, which form such a common constituent of quack horse powders; new oats still imperfectly cured; an excess of roots or other very watery food; a full allowance of salt to animals that have become inordinately fond of it; but above all, feeding on hay, grain, or bran which has not been properly dried and has become musty. Thus hay, straw, or oats secured in wet seasons and heating in the rick or stack is especially injurious. Hence this malady, like sleepy staggers, is widespread in wet seasons, and especially in rainy districts.

Symptoms.—The horse drinks deep at every opportunity and passes urine on every occasion when stopped, the discharge being pale, watery, of a low density, and inodorous; in short, it contains a great excess of water and a deficiency of the solid excretions. So great is the quantity passed, however, that the small amount of solids in any given specimen amounts in twenty-four hours to far more than the normal—a fact in keeping with the rapid wasting of the tissues and extreme emaciation. The flanks become tucked up, the fat disappears, the bones and muscles stand out prominently, the skin becomes tense and hidebound, and the hair erect, scurfy, and deficient in luster. The eye becomes dull and sunken, the spirits are depressed, the animal is weak and sluggish, sweats on the slightest exertion, and can endure little. The subject may survive for months, or he may die early of exhaustion. In the slighter cases, or when the cause ceases to operate, he may make a somewhat tardy recovery.

Treatment.—This consists in stopping the ingestion of the faulty drugs, poisons, or food, and supplying sound hay and grain free from all taint of heating or mustiness. A liberal supply of boiled flaxseed in the drinking water at once serves to eliminate the poison and to sheathe and protect the irritated kidneys. Tonics like sulphate or phosphate of iron (2 drams morning and evening) help greatly by bracing the system and hastening repair. To these may be added agents calculated to destroy the fungus and eliminate its poisonous products. In that form which depends on musty food nothing acts better than creosote, carbolic acid (1 dram), or oil of turpentine (4 drams) properly diluted.

SACCHARINE DIABETES (DIABETES MELLITUS, GLYCOSURIA, OR INOSURIA).

This is primarily a disease of the nervous system or liver rather than of the kidneys, yet, as the most prominent symptom is the sweet urine, it may be treated here.

Causes.—Its causes are varied, but resolve themselves largely into disorder of the liver or disorder of the brain. One of the most prominent functions of the liver is the formation of glycogen, a principle allied to grape sugar. This is a constant function of the liver, but in health the resulting sugar is burned up in the circulation and does not appear in the urine. On the contrary, when the supply of oxygen is defective, as in certain diseases of the lungs, the whole of the sugar does not undergo combustion and the excess is excreted by the kidneys. Also in certain forms of enlarged liver the amount of sugar produced is more than can be disposed of in the natural way, and it appears in the urine. A temporary sweetness of the urine often occurs after a hearty meal on starchy food, but this is due altogether to the superabundant supply of the sugar-forming food, lasts for a few hours only, and has no pathological significance. In many cases of fatal glycosuria the liver is found to be enlarged, or at least congested, and it is found that the disorder can be produced experimentally by agencies which produce an increased circulation through the liver. Thus Bernard produced glycosuria by pricking the oblong medulla at the base of the brain close to the roots of the pneumogastric nerve, which happens to be also the nerve center which presides over the contractions of the minute blood vessels. The pricking and irritation of this center leads to congestion of the liver and the excessive production of sugar. Irritation carried to this point through the pneumogastric nerve causes saccharine urine, and, in keeping with this, disease of the pancreas has been found in this malady. The complete removal of the pancreas, however, determines glycosuria, the organ having in health an inhibitive action on sugar production by the liver. The same result follows the reflection of irritation from other sources, as from different ganglia of the brain. Similarly it is induced by interruption of the nervous control along the vaso-motor tracts, as in destruction of the upper or lower cervical sympathetic ganglion, by cutting the nervous branch connecting these two, in injury to the spinal marrow in the interval between the brain and the second or fourth dorsal vertebra, or in disease of the celiac plexus, which directly presides over the liver. Certain chemical poisons also cause saccharine urine, notably strychnia, morphia, alcohol, ether, chloroform, ammonia, and arsenic.

Symptoms.—The symptoms are ardent thirst and profuse secretion of a pale urine of a high density, rapid loss of condition, scurvy, unthrifty skin, costiveness or irregularity of the bowels, indigestion, and the presence in the urine of grape-sugar. This may be most promptly detected by touching the tip of the tongue with a drop. Sugar may be detected simply by adding a teaspoonful of liquid yeast to 4 ounces of the urine and keeping it lightly stopped at a temperature of 70° to 80° F. for twelve hours, when the sugar will be found to have been changed into alcohol and carbon dioxide.

Treatment.—It is most satisfactory in cases dependent on some curable disease of liver, pancreas, lungs, or brain. Thus, in liver diseases, a run at pasture in warm weather, or in winter a warm, sunny, well-aired stable, with sufficient clothing and laxatives (sulphate of soda, 1 ounce daily) and alkalies (carbonate of potassium, one-fourth ounce) may benefit. To this may be added mild blistering or even leeching over the last ribs. Diseases of the brain or pancreas may be treated according to their indications. The diet should be mainly albuminous, such as wheat bran or middlings, pease, beans, vetches, and milk. Indeed, an exclusive milk diet is one of the very best remedial agencies. It may be given as skimmed milk or buttermilk, and in the last case combines an antidiabetic remedy in the lactic acid. Under such an exclusive diet recent and mild cases are often entirely restored, though at the expense of an attack of rheumatism.

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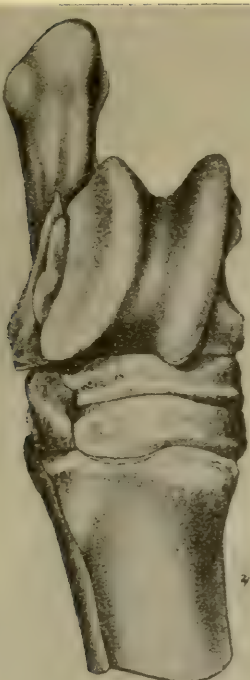

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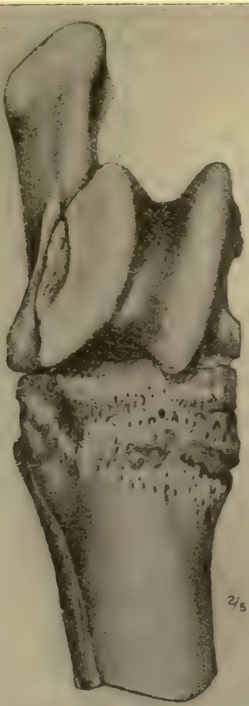

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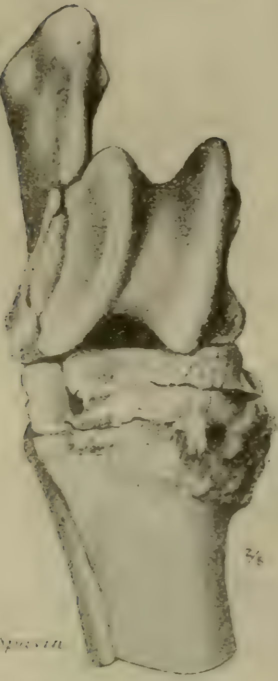

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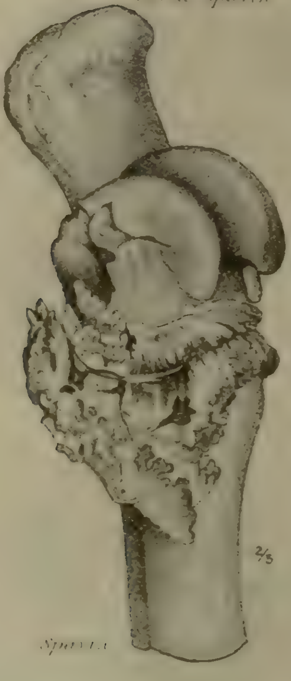

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BONE SPAVIN. HORSE BOOK, B. A. I.

Salicylic acid and salicylate of sodium have proved useful in certain cases; also phosphate of sodium. Bitter tonics (especially nux vomica one-half dram) are useful in improving the digestion and general health.

BLOODY URINE, OR HEMATURIA.

Cause.—As seen in the horse, bloody urine is usually the direct result of mechanical injuries, as sprains and fractures of the loins, irritation caused by stone in the kidney, ureter, bladder, or urethra. It may, however, occur with acute congestion of the kidneys, with tumors in its substance, or other diseased growth in the bladder. Acrid diuretic plants present in the food may also lead to the escape of blood from the kidney. The predisposition to this affection is, however, incomparably less than in the case of the ox or the sheep, the difference being attributed to the greater plasticity of the horse's blood in connection with the larger quantity of fibrin.

The blood may be present in small clots or in more or less intimate admixture with the urine. Its condition may furnish some indication as to its source; thus, if from the kidneys it is more likely to be uniformly diffused through the urine, while as furnished by the bladder or passages clots are more likely to be present. Again, in bleeding from the kidney, minute cylindrical clots inclosing blood globules can be detected under the microscope. Precision also may be approximated by observing whether there is coexisting fracture, sprain of the loins, or stone or tumor in the bladder or urethra.

Treatment.—The disease being mainly due to direct injury, treatment will consist, first, in removing such cause whenever possible, and then in applying general and local styptics. Irritants in food must be avoided, sprains appropriately treated, and stone in bladder or urethra removed. Then give mucilaginous drinks (slippery elm, linseed tea) freely, and styptics (tincture of chloride of iron 3 drams, acetate of lead ½ dram, tannic acid ½ dram, or oil of turpentine 1 ounce). If the discharge is abundant, apply cold water to the loins and keep the animal perfectly still.

HEMOGLOBINURIA (AZOTURIA, ZOTEMIA, POISONING BY ALBUMINOIDS).

Like diabetes, this is rather a disease of the liver and blood-forming functions than of the kidney, but as prominent symptoms are loss of control over the hind limbs and the passage of ropy and dark-colored urine, the vulgar idea is that it is a disorder of the urinary organs. It is a complex affection directly connected with a plethora in the blood of nitrogenized constituents, with extreme nervous and muscular disorder and the excretion of a dense reddish or brownish urine. It is directly connected with high feeding, especially on highly nitrogenized food (oats, beans, pease, vetches, cotton-seed meal), and with a period of idleness in the stall under full rations. The disease is never seen at pasture, rarely under constant daily work, even though the feeding be high, and the attack is usually precipitated by taking the horse from the stable and subjecting it to exercise or work. The poisoning is not present when taken from the stable, as the horse is likely to be noticeably lively and spirited, but he will usually succumb under the first hundred yards or half mile of exercise.

Symptoms.—In the milder forms this affection may appear as a lameness in one limb, from indefinite cause, succeeding to some sudden exertion and attended by a dusky-brown color of the membranes of the eye and nose and some wincing when the last ribs are struck. The severe forms come on after one or two days of rest on a full ration, when the animal has been taken out and driven one hundred paces or more. The fire and life with which he had left the stable suddenly give place to dullness and oppression, as shown in heaving flanks, dilated nostrils, pinched face, perspiring skin, and trembling body. The muscles of the loins or haunch become swelled and rigid, the subject moves stiffly or unsteadily, crouches behind, the limbs being carried semiflexed, and he soon drops, unable to support himself. When down, the body and limbs are moved convulsively. The pulse and breathing are accelerated, the eyes red with a tinge of brown, and the urine, if passed, is seen to be highly colored, dark brown, red, or black, but it contains neither blood clots nor globules.

It may end fatally in a few hours or days, or a recovery may ensue, which is usually more speedy and perfect if it has set in at an early stage. In the late and tardy recoveries a partial paralysis of the hind limbs may last for months. A frequent sequel of these tardy cases is an extensive wasting of the muscles leading up from the front of the stifle and a complete inability to stand.

Prevention.—The prevention of this serious affection lies in restricting the diet and giving daily exercise when the animal is not at work. A horse that has had one attack should never be left idle for a single day in the stall or barnyard. When a horse has been condemned to absolute repose on good feeding he may have a laxative (one-half to 1 pound Glauber's salts), and have graduated exercise, beginning with a short walk and increasing day by day.

Treatment.—The treatment of the mild cases may consist in a laxative, graduated daily exercise, and a daily dose of saltpeter (1 ounce). Sudden attacks will sometimes promptly subside if taken on the instant and the subject kept still and calmed by a dose of bromide of potassium (4 drams) and sweet spirits of niter (1 ounce). The latter has the advantage of increasing the secretion of the kidneys. In severe cases, as a rule, it is desirable to begin treatment by a dose of aloes (4 to 6 drams). Fomentations with warm water over the loins are always useful in calming the excitable conditions of the spinal cord, muscles, liver, and kidneys, and also in favoring secretion from the two latter. On the second day diuretics may be resorted to, such as saltpeter one-half ounce, and powdered colchicum one-half dram, to be repeated twice daily. A laxative may be repeated in three or four days should the bowels seem to demand it, and as the nervous excitement disappears any remaining muscular weakness or paralysis may be treated by one-half dram nux vomica twice a day and a stimulating liniment (aqua ammonia and sweet oil in equal proportions) rubbed on the torpid muscles.

During the course of the disease friction to the limbs is useful, and in the advanced paralytic stage the application of electricity along the line of the affected muscles. When the patient can not stand he must have a thick, soft bed, and should be turned from side to side at least every twelve hours. As soon as he can be made to stand he may be helped up and even supported in a sling.

ACUTE INFLAMMATION OF THE KIDNEYS, OR ACUTE NEPHRITIS.

Inflammations of the kidneys have been differentiated widely, according as they were acute or chronic, parenchymatous or tubal, suppurative or not, with increased or shrunken kidney, etc.; but in a work like the present utility will be consulted by classing all under *acute or chronic inflammation.*

Causes.—The causes of inflammation of the kidneys are extremely varied. Congestion occurs from the altered and irritant products passed through these organs during recovery from inflammations of other organs and during fevers. This may last only during the existence of its cause, or may persist and become aggravated. Heart disease, throwing the blood pressure back on the veins and kidneys, is another cause. Disease of the ureter or bladder, preventing the escape of urine from the kidney and causing increased fullness and tension in its pelvis and tubes, will determine inflammation. Decomposition of the detained urine in such cases and the production of ammonia and other irritants must also be named. In elimination of bacteria through the kidney, the latter is liable to infection with consequent inflammation. The advance of bacteria upward from the bladder to the kidneys is another cause. The consumption in hay or other fodder of irritant plants, the absorption of cantharidine from a surface blistered by Spanish flies, the reckless administration of diuretics, exposure of the surface to cold and wet, and the infliction of blows or sprains on the loins, may contribute to its production. Liver disorders which throw on the kidneys the work of excreting irritant products, diseases of the lungs and heart from which clots are carried, to be arrested in the small blood vessels of the kidney, and injuries and paralysis of the spinal cord, are additional causes.

Symptoms.—The symptoms are more or less fever, manifest stiffness of the back and straddling gait with the hind limbs, difficulty in lying down and rising, or in walking in a circle, the animal sometimes groaning under the effort, arching of the loins and tucking up of the flank, looking back at the abdomen as if from colicky pain, and tenderness of the loins to pinching, especially just beneath the bony processes 6 inches to one side of the median line. Urine is passed frequently, a small quantity at a time, of a high color, and sometimes mixed with blood or even pus. The legs tend to swell from the foot up, also the dependent parts beneath the belly and chest, and effusions of liquid may occur within the chest or abdomen. In the male animal the alternate drawing up and relaxation of the testicles in the scrotum are suggestive, and in small horses the oiled hand introduced into the rectum may reach the kidney and ascertain its sensitiveness.

Treatment.—Treatment demands, first, the removal of the cause. Then, if the suffering and fever are high, 2 to 4 quarts of blood may be abstracted from the jugular vein; in weak subjects or unless in high fever this should be omitted. Next relieve the kidneys so far as possible by throwing their work on the bowels and skin. A pint of castor oil is less likely than either aloes or salts to act on the kidneys. To affect the skin a warm stall and heavy clothing may be supplemented by dram doses of Dover's powder. Pain may be soothed by dram doses of bromide of potassium. Boiled flaxseed may be added to the drinking water, and also thrown into the rectum as an injection, and blankets saturated with hot water should be persistently applied to the loins. This may be followed by a very thin pulp of the best ground mustard made with tepid water, rubbed in against the direction of the hair and covered up with paper and a blanket. This may be kept on for an hour, or until the skin thickens and the hair stands erect. It may then be rubbed or sponged off and the blanket reapplied. When the action of the bowels has been started it may be kept up by a daily dose of 2 or 3 ounces of Glauber's salts.

During recovery a course of bitter tonics (nux vomica 1 scruple, ground gentian root 4 drams) should be given. The patient should also be guarded against cold, wet, and any active exertion for some time after all active symptoms have subsided.

CHRONIC INFLAMMATION OF THE KIDNEYS.

Causes.—Chronic inflammation of the kidneys is more commonly associated with albumen and casts in the urine than the acute form, and in some instances these conditions of the urine may be the only prominent symptoms of the disease. Though it may supervene on blows, injuries, and exposures, it is much more commonly connected with faulty conditions of the system—as indigestion, heart disease, lung or liver disease, imperfect blood formation, or assimilation; in short, it is rather the attendant on a constitutional infirmity than on a simple local injury. It may be associated with various forms of diseased kidneys, as shrinkage, increase in size, softening, red congestion, white enlargement, etc., so that it forms a group of diseases rather than a disease by itself.

Symptoms.—The symptoms may include stiffness, weakness, and increased sensibility of the loins, and modified secretion of urine, or the flow may be natural. Dropsy, manifested in swelled legs, is a significant symptom, and if the effusion takes place along the lower line of the body or in chest or abdomen, the significance is increased. A scurfy, unthrifty skin, lack-luster hair, inability to sustain severe or continued exertion, poor or irregular appetite, loss of fat and flesh, softness of the muscles, and pallor of the eyes and nose are equally suggestive. So are skin eruptions of various kinds.

Treatment.—Treatment of these cases is not always satisfactory, as the cause is liable to continue in disorders of important organs elsewhere. If any such coincident disease of another organ or function can be detected, that should be treated first or simultaneously with this affection of the kidneys. In all cases the building up of the general health is important. Hence a course of tonics may be given (phosphate of iron 2 drams, nux vomica 20 grains, powdered gentian root 4 drams, daily) or 60 drops of sulphuric acid or nitromuriatic acid may be given daily in the drinking water. If there is any elevated temperature of the body and tenderness of the loins, fomentations may be applied, followed by a mustard pulp, as for acute inflammation, and even in the absence of these indications the mustard may be resorted to with advantage at intervals of a few days. In suppression of urine, fomentations with warm water or with infusion of digitalis leaves is a safer resort than diuretics, and cupping over the loins may also benefit. To apply a cup, shave the skin and oil it; then take a narrow-mouthed glass, rarify the air within it by introducing a taper in full flame for a second, withdraw the taper and instantly apply the mouth of the glass to the skin and hold it closely applied till the cooling tends to form a vacuum in the glass and to draw up the skin, like a sucker.

As in the acute inflammation, every attention must be given to secure warm clothing, a warm stall, and pure air.

SPASM OF THE NECK OF THE BLADDER.

This affection consists in spasmodic closure of the outlet from the bladder by contraction of the circular muscular fibers. It may be accompanied by a painful contraction of the muscles on the body of the bladder; or, if the organ is already unduly distended, these will be affected with temporary paralysis. It is most frequent in the horse, but by no means unknown in the mare.

Causes.—The causes are usually hard and continuous driving without opportunity for passing urine, cold rainstorms, drafts of cold air when perspiring and fatigued, the administration of Spanish fly or the application of extensive blisters of the same. As most mares refuse to urinate while in harness, they should be unhitched at suitable times for urination. Spasms of the bowels are always attended by spasm of the bladder, hence the free passage of water is usually a symptom of relief.

Symptoms.—The symptoms are frequent stretching and straining to urinate, with no result or a slight dribbling only. These vain efforts are attended by pain and groaning. On resuming his natural position the animal is not freed from the pain, but moves uneasily, paws, shakes the tail, kicks at the abdomen with his hind feet, looks back to the flank, lies down and rises, arches the back, and attempts to urinate as before. If the oiled hand is introduced into the rectum the greatly distended bladder may be felt beneath, and the patient will often shrink when it is handled.

It is important to notice that irritation of the urinary organs is often present in impaction of the colon with solid matters, because the impacted intestine under the straining of the patient is forced backward into the pelvis and presses upon and irritates the bladder. In such cases the horse stands with his fore limbs advanced and the hind ones stretched back beyond the natural posture, and makes frequent efforts to urinate with varying success. Unpracticed observers naturally conclude that the secondary urinary trouble is the main and only one, and the intestinal impaction and obstruction is too often neglected until it is irremediable. In cases where the irritation has caused spasm of the neck of the bladder and overdistention of that organ, the mistake is still more easily made; hence it is important in all cases to examine for the impacted bowel, forming a bend, or loop, at the entrance of the pelvis and usually toward the left side. The impacted intestine feels soft and doughy, and is easily indented with the knuckles, forming a marked contrast with the tense, elastic, resilient, overdistended bladder.

It remains to be noted that similar symptoms may be determined by a stone or sebaceous mass, or stricture obstructing the urethra, or in the newborn by thickened mucus in that duct and by the pressure of hardened, impacted feces in the rectum. In obstruction, the hard, impacted body can usually be felt by tracing the urethra along the lower and posterior surface of the penis and forward to the median line of the floor of the pelvis to the neck of the bladder. That part of the urethra between the seat of obstruction and the bladder is usually distended with urine, and feels enlarged, elastic, and fluctuating.

Treatment.—Treatment may be begun by taking the animal out of harness. This failing, spread clean litter beneath the belly or turn the patient out on the dung heap. Some seek to establish sympathetic action by pouring water from one vessel into another with dribbling noise. Others soothe and distract the attention by slow whistling. Friction of the abdomen with wisps of straw may succeed, or it may be rubbed with ammonia and oil. These failing, an injection of 2 ounces of laudanum or of an infusion of 1 ounce of tobacco in water may be tried. In the mare the neck of the bladder is easily dilated by inserting two oiled fingers and slightly parting them. In the horse the oiled hand introduced into the rectum may press from before backward on the anterior or blind end of the bladder. Finally, a well-oiled gum-elastic catheter may be entered into the urethra at the end of the penis and pushed on carefully until it has entered the bladder. To effect this the penis must first be withdrawn from its sheath, and when the advancing end of the catheter has reached the bend of the urethra beneath the anus it must be guided forward by pressure with the hand, which guidance must be continued onward into the bladder, the oiled hand being introduced into the rectum for this purpose. The horse catheter, 3½ feet long and one-third inch in diameter, may be bought of a surgical instrument maker.

PARALYSIS OF THE BLADDER.

Paralysis of the body of the bladder with spasm of the neck has been described under the last heading, and may occur in the same way from overdistention in tetanus and acute rheumatism, in which the animal cannot stretch himself to stale, and in cystitis, affecting the body of the bladder but not the neck. In all these cases the urine is suppressed. It also occurs as a result of disease of the posterior end of the spinal marrow and with broken back, and is then associated with palsy of the tail, and, it may be, of the hind limbs.

Symptoms.—The symptoms are a constant dribbling of urine when the neck is involved, the liquid running down the inside of the thighs and irritating the skin. When the neck is unaffected the urine is retained until the bladder is greatly overdistended, when it may be expelled in a gush by the active contraction of the muscular walls of the abdomen; but this never empties the bladder, and the oiled hand introduced through the rectum may feel the soft, flabby organ still half full of urine. This retained urine is liable to decompose and give off ammonia, which dissolves the epithelial cells, exposing the raw mucous membrane and causing the worst type of cystitis. Suppression and incontinence of urine are common also to obstruction of the urethra by stone or otherwise; hence this source of fallacy should be excluded by manual examination along the whole course of that duct.

Treatment.—Treatment is only applicable in cases in which the determining cause can be abated. In remedial sprains of the back or disease of the spinal cord these must have appropriate treatment, and the urine must be drawn off frequently with a catheter to prevent overdistention and injury to the bladder. If the paralysis persists after recovery of the spinal cord, or if it continues after relief of spasm of the neck of the bladder, apply a pulp of mustard and water over the back part of the belly in front of the udder, and cover with a rug until the hair stands erect. In the male the mustard may be applied between the thighs from near the anus downward. Daily doses of 2 grains powdered Spanish fly may serve to rouse the lost tone. These failing, a mild current of electricity daily may succeed.

INFLAMMATION OF THE BLADDER (CYSTITIS, OR UROCYSTITIS).

Cystitis may be slight or severe, acute or chronic, partial or general. It may be caused by abuse of diuretics, especially such as are irritating (cantharides, turpentine, copaiba, resin, etc.), by the presence of a stone or gravel in the bladder, the irritation of a catheter or other foreign body introduced from without, the septic ferment (bacterium) introduced on a filthy catheter, the overdistention of the bladder by retained urine, the extrication of ammonia from retained decomposing urine, resulting in destruction of the epithelial cells and irritation of the raw surface, and a too concentrated and irritating urine. The application of Spanish flies or turpentine over a too extensive surface, sudden exposure of a perspiring and tired horse to cold or wet, and the presence of acrid plants in the fodder may cause cystitis, as they may nephritis. Finally, inflammation may extend from a diseased vagina or urethra to the bladder.

Symptoms.—The symptoms are slight or severe colicky pains; the animal moves his hind feet uneasily or even kicks at the abdomen, looks around at his flank, and may even lie down and rise frequently. More characteristic are frequently repeated efforts to urinate, resulting in the discharge of a little clear, or red, or more commonly flocculent urine, always in jets, and accompanied by signs of pain, which persist after the discharge, as shown in continued straining, groaning, and perhaps in movements of the feet and tail. The penis hangs from the sheath, or in the mare the vulva is frequently opened and closed, as after urination. The animal winces when the abdomen is pressed in the region of the sheath or udder, and the bladder is found to be sensitive and tender when pressed with the oiled hand introduced through the rectum or vagina. In the mare the thickening of the walls of the bladder may be felt by introducing one finger through the urethra. The discharged urine, which may be turbid or even oily, contains an excess of mucus, with flat shreds of membrane, with scaly epithelial cells, and pus corpuscles, each showing two or more nuclei when treated with acetic acid, but there are no miscroscopic tubular casts, as in nephritis. If due to stone in the bladder, that will be found on examination through rectum or vagina.

Treatment.—This implies, first, the removal of the cause, whether poisons in food or as medicine, the removal of Spanish flies or other blistering agents from the skin, or the extraction of stone or gravel. If the urine has been retained and decomposed it must be completely evacuated through a clean catheter, and the bladder thoroughly washed out with a solution of 1 dram of borax in a quart of water. This must be repeated twice daily until the urine no longer decomposes, because so long as ammonia is developed in the bladder the protecting layer of epithelial cells will be dissolved and the surface kept raw and irritable. The diet must be light (bran mashes, roots, fresh grass), and the drink impregnated with linseed tea, or solution of slippery elm or marsh mallow. The same agents may be used to inject into the rectum, or they may even be used along with borax and opium to inject into bladder (gum arabic 1 dram, opium 1 dram, tepid water 1 pint). Fomentations over the loins are often of great advantage, and these may be followed or alternated with the application of mustard, as in paralysis; or the mustard may be applied on the back part of the abdomen below or between the thighs from the anus downward. Finally, when the acute symptoms have subsided, a daily dose of buchu 1 dram and nux vomica one-half dram will serve to restore lost tone.

IRRITABLE BLADDER.

Some horses, and especially mares, show an irritability of the bladder and nerve centers presiding over it by frequent urination in small quantities, though the urine is not manifestly changed in character and no more than the natural amount is passed in the twenty-four hours. The disorder appears to have its source quite as frequently in the generative or nervous system as in the urinary. A troublesome and dangerous form is seen in mares, which dash off and refuse all control by the rein if driven with a full bladder, but usually prove docile if the bladder has been emptied before hitching. In other cases the excitement connected with getting the tail over the reins is a powerful determining cause. The condition is marked in many mares during the period of heat.

An oleaginous laxative (castor oil 1 pint) will serve to remove any cause of irritation in the digestive organs, and a careful dieting will avoid continued irritation by acrid vegetable agents. The bladder should be examined to see that there is no stone or other cause of

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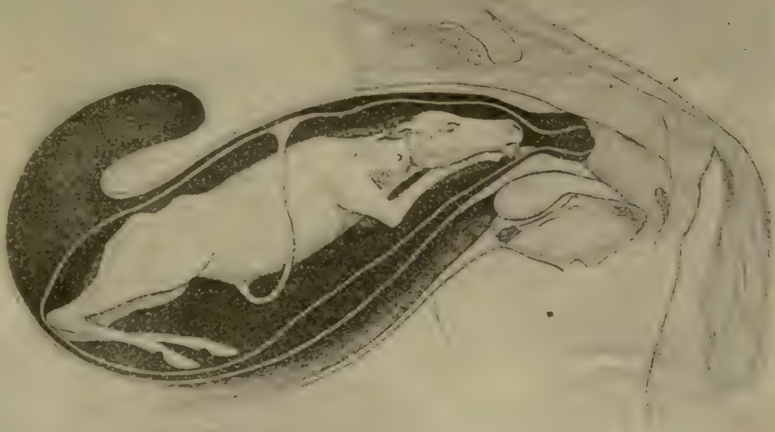

Vertebro Sacral presentation

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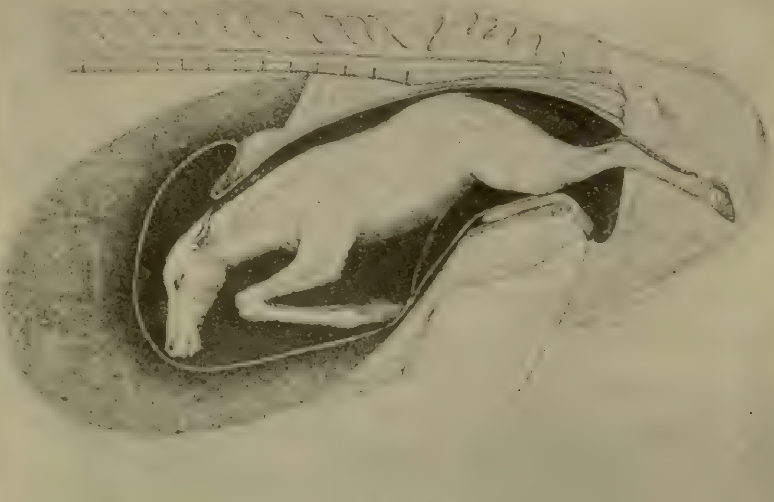


Lumbo Sacral presentation

NORMAL PRESENTATIONS, HORSE BOOK, B. A. I.

irritation, and the sheath and penis should be washed with soapsuds, any sebaceous matter removed from the end of the penis, and the whole lubricated with sweet oil. Irritable mares should be induced to urinate before they are harnessed, and those that clutch the lines under the tail may have the tail set high by cutting the cords on its lower surface, or it may be prevented getting over the reins by having a strap carried from its free end to the breeching. Those proving troublesome when in heat may have 4-dram doses of bromide of potassium, or they may be served by the male or castrated.

DISEASED GROWTH IN THE BLADDER.

These may be of various kinds. They may be attached to the mucous membrane by a narrow neck or by a broad base covering a great part of the organ.

Symptoms.—The symptoms are frequent straining, passing of urine and blood with occasionally gravel. An examination of the bladder with the hand in the rectum will detect the new growth, which may be distinguished from a hard resistant stone. In mares, in which the finger can be inserted into the bladder, the recognition is still more satisfactory. The polypi attached by narrow necks may be removed by surgical operation, but for those with broad attachments treatment is eminently unsatisfactory.

DISCHARGE OF URINE BY THE NAVEL, OR PERSISTENT URACHUS.

This occurs only in the newborn, and consists in the nonclosure of the natural channel through which the urine is discharged into the outer water bag in fetal life. At that early stage of the animal existence the bladder resembles a long tube, which is prolonged through the navel string and opens into the outermost of the two water bags in which the fetus floats. In this way the urine is prevented from entering the inner water bag, where it would mingle with the liquids, bathing the skin of the fetus and cause irritation. At birth this channel closes up, and the urine takes the course normal to extra-uterine life. Imperfect closure is more frequent in males than in females, because of the great length and small caliber of the male urethra and its consequent tendency to obstruction. In the female there may be a discharge of a few drops only at a time, while in the male the urine will be expelled in strong jets coincidently with the contractions of the bladder and walls of the abdomen.

The first care is to ascertain if the urethra is previous by passing a human catheter. This determined, the open urachus may be firmly closed by a stout waxed thread, carried with a needle through the tissues back of the opening and tied in front of it so as to inclose as little skin as possible. If a portion of the navel string remains, the tying of that may be all sufficient. It is important to tie as early as possible so as to avoid inflammation of the navel from contact with the urine. In summer a little carbolic-acid water or tar water may be applied to keep off the flies.

EVERSION OF THE BLADDER.

This can only occur in the female. It consists in the turning of the organ outside in through the channel of the urethra, so that it appears as a red, pear-shaped mass hanging from the floor of the vulva and protruding externally between its lips. It may be a mass like the fist, or may swell up to the size of an infant's head. On examining its upper surface the orifices of the urethra may be seen, one on each side, a short distance behind the neck, with the urine oozing from them drop by drop. This displacement usually supervenes on a flaccid condition of the bladder, the result of paralysis, overdistention, or severe compression during a difficult parturition.

The protruding organ may be washed with a solution of 1 ounce of laudanum and a teaspoonful of carbolic acid in a quart of water, and returned by pressing a smooth, rounded object into the fundus and directing it into the urethra, while careful pressure is made on the surrounding parts with the other hand. If too large and resistant it may be wound tightly in a strip of bandage about 2 inches broad to express the great mass of blood and exudate and diminish the bulk of the protruded organ so that it can be easily pushed back. This method has the additional advantage of protecting the organ against bruises and lacerations in the effort made to return it. After the return, straining may be kept in check by giving laudanum (1 to 2 ounces) and by applying a truss to press upon the lips of the vulva. The patient should be kept in a stall a few inches lower in front than behind, so that the action of gravity will favor retention.

INFLAMMATION OF THE URETHRA (URETHRITIS, OR GLEET).

This affection belongs quite as much to the generative organs, yet it can not be entirely overlooked in a treatise on urinary disorders. It may be induced by the passage and temporary arrest of small stones, or gravel; by the irritation caused by foreign bodies introduced from without; by blows on the penis by sticks, stones, or by the feet of a mare that kicks while being served; by an infecting inflammation contracted from a mare served in the first few days after parturition; by infecting matter introduced on a dirty catheter, or by the extension of inflammation from an uncleansed sheath.

Symptoms.—The symptoms are swelling, heat, and tenderness of the sheath and penis; difficulty, pain, and groaning in passing urine, which is liable to sudden temporary arrests in the course of micturition, and later a whitish mucopurulent oozing from the papilla on the end of the penis. There is a tendency to erection of the penis, and in cases contracted from a mare the outer surface of that organ will show more or less extensive sores and ulcers. Stallions suffering in this way will refuse to mount, or having mounted will fail to complete the act of coition. If an entrance is effected infection of the mare is liable to follow.

Treatment in the early stages consists in a dose of physic (aloes 6 drams) and fomentations of warm water to the sheath and penis. If there is reason to suspect the presence of infection, inject the urethra twice daily with borax 1 dram, water 1 quart, using it tepid. Where the mucopurulent discharge indicates the supervention of the second stage, a more astringent injection may be employed (nitrate of silver 20 grains, water 1 quart), and the same may be applied to the surface of the penis and inside the sheath. Every stallion suffering from urethritis should be withheld from service, as should mares with leucorrhea.

STRICTURE OF THE URETHRA.

This is a permanent narrowing of the urethra at a given point, the result of previous inflammation, caused by the passage or arrest of a stone, or gravel, by strong astringent injections in the early non-secreting stages of urethritis, or by contracting of the lining membrane occurring during the healing of ulcers in neglected inflammations of that canal. The trouble is shown by the passage of urine in a fine stream, with straining, pain, and groaning, and by frequent painful erections. It must be remedied by mechanical dilatation, with catheters just large enough to pass with gentle force, to be inserted once a day, and to be used of larger size as the passage will admit them. The catheter should be kept perfectly clean, and washed in a borax solution and well oiled before it is introduced.—(Spl. Rpt. Horses, Dept. Ag. 1911.)

DISEASES AFFECTING LOCOMOTION.

It is as living, organized, locomotive machines that the horse, camel, ox, and their burden-bearing companions are of practical value to man. Hence the consideration of their usefulness and consequent value to their human masters ultimately and naturally resolves itself into an inquiry concerning the condition of that special portion of their organism which controls their function of locomotion. This is especially true in regard to the members of the equine family, the most numerous and valuable of all the beasts of burden, and it naturally follows that with the horse for a subject of discussion the special topic and leading theme of inquiry will, by an easy lapse, become an inquest into the condition and efficiency of his power for usefulness as a carrier or traveler. There is a large amount of abstract interest in the study of that endowment of the animal economy which enables its possessor to change his place at will and convey himself whithersoever his needs or his moods may incline him; but how much greater the interest that attaches to the subject when it becomes a practical and economic question and includes within its purview the various related topics which belong to the domains of physiology, pathology, therapeutics, and the entire round of scientific investigation into which it is finally merged as a subject for medical and surgical consideration—in a word, of actual disease and its treatment! It is not surprising that the intricate and complicated apparatus of locomotion, with its symmetry and harmony of movement and the perfection and beauty of its details and adjuncts, should, by students of creative design and attentive observers of nature and her marvelous contrivances and adaptations, be admiringly denominated a *living machine*.

The horse in a state of domesticity is of all the animal tribe the largest sharer with his master in his liability to the accidents and dangers which are among the incidents of civilized life. From his exposure to the missiles of war on the battlefield to his chance of picking up a nail from the city pavement there is no hour when he is not in danger of incurring injuries which for their repair may demand the best skill of the veterinary practitioner. And this is true not alone of casualties which belong to the class of external and traumatic cases, but includes as well those of a kind perhaps more numerous, which may result in lesions of internal parts, frequently the most serious and obscure of all in their nature and effects.

The horse is too important a factor in the practical details of human life and fills too large a place in the business and pleasure of the world to justify any indifference to his needs and physical comfort or neglect in respect to the preservation of his peculiar powers for usefulness.

The function of locomotion is performed by the action of two principal systems of organs, known in anatomical and physiological terminology as passive and active, the muscles performing the active and the bones the passive portion of the movement. The necessary connection between the co-operating parts of the organism is effected by means of a vital contact by which the muscle is attached to the bone at certain determinate points on the surface of the latter. These points of attachment appear sometimes as an eminence, sometimes a depression, sometimes a border or an angle, or again as a mere roughness, but each perfectly fulfilling its purpose; while the necessary motion is provided for by the formation of the ends of the long bones into the requisite articulations, joints, or hinges. Every motion is the product of the contraction of one or more of the muscles, which, as it acts upon the bony levers, gives rise to a movement of extension or flexion, abduction or adduction, rotation or circumduction. The movement of abduction is that which passes from and that of adduction that which passes toward the median line, or the center of the body. The movement of flexion and extension are too well understood to need defining. It is the combination and rapid alternations of these movements which produce the different postures and various gaits of the living animal, and it is their interruption and derangement, from whatsoever cause, which constitute the pathological condition of lameness.

DEFINITION OF LAMENESS.

Physiology.—Comprehensively and universally considered, then, the term lameness signifies any irregularity or derangement of the function of locomotion, irrespective of the cause which produced it or the degree of its manifestation. However slightly or severely it may be exhibited, it is all the same. The nicest observation may be demanded for its detection, and it may need the most thoroughly trained powers of discernment to identify and locate it, as in some cases where the animal is said to be fainting, tender, or to go sore. On the contrary, the patient may be so far affected as to refuse utterly to use an injured leg, and under compulsory motion keep it raised from the ground, and prefer to travel on three legs rather than to bear any portion of his weight upon the afflicted member. In these two extremes, and in all the intermediate degrees, the patient is simply lame —pathognomonic minutiæ being considered and settled in a place of their own.

This last condition of disabled function—lameness on three legs—and many of the lower degrees of simple lameness are very easy of detection, but the first, or mere tenderness or soreness, may be very difficult to identify, and at times very serious results have followed from the obscurity which has enveloped the early stages of the malady. For it may easily occur that in the absence of the treatment which an early correct diagnosis would have indicated, an insidious ailment may so take advantage of the lapse of time as to root itself too deeply into the economy to be subverted, and become transformed into a disabling chronic case, or possibly one that is incurable and fatal. Hence the impolicy of depreciating early symptoms because they are unaccompanied by distinct and pronounced characteristics, and from a lack of threatening appearances inferring the absence of danger. The possibilities of an ambush can never be safely ignored. An extra caution costs nothing, even if wasted. The fulfillment of the first duty of a practitioner, when introduced to a case, is not always an easy task, though it is too frequently expected that the diagnosis, or what is the matter verdict, will be reached by the quickest and surest kind of an instantaneous process and a sure prognosis, or how it will end, guessed at instanter.

Usually the discovery that the animal is becoming lame is comparatively an easy matter to a careful observer. Such a person will readily note the changes of movement which will have taken place in the animal he has been accustomed to drive or ride, unless they are indeed slight and limited to the last degree. But what is not always easy is the detection, after discovering the fact of an existing irregularity, of the locality of its point of origin, and whether its seat be in the near or off leg, or in the fore or the hind part of the body. These are questions too often wrongly answered, notwithstanding the fact that with a little careful scrutiny the point may be easily settled. The error, which is too often committed, of pronouncing the leg upon which the animal travels soundly as the seat of the lameness, is the result of a misinterpretation of the physiology of locomotion in the crippled animal. Much depends upon the gait with which the animal moves while under examination. The act of walking is unfavorable for accurate observation, though, if the animal walks on three legs, the decision is easy to reach. The action of galloping will often, by the rapidity of the muscular movements and their quick succession, interfere with a nice study of their rhythm, and it is only under some peculiar circumstances that the examination can be safely conducted while the animal is moving with that gait. It is while the animal is trotting that the investigation is made with the best chances of an intelligent decision, and it is while moving with that gait, therefore, that the points should be looked for which must form the elements of the diagnosis.

Our first consideration should be the physiology of normal or healthy locomotion, that from thence we may the more easily reach our conclusions touching lameness, or that which is abnormal, and by this process we ought to succeed in obtaining a clew to the solution of the first problem, to wit, in which leg is the seat of the lameness?

A word of definition is here necessary, in order to render that which follows more easily intelligible. In veterinary nomenclature each two of the legs, as referred to in pairs, is denominated a biped. Of the four points occupied by the feet of the animal while standing at rest, forming a square, the two fore legs are known as the anterior biped; the two hinder, the posterior; the two on one side, the lateral; and one of either the front or hind biped with the opposite leg of the hind or front biped will form the diagonal biped.

Considering, as it is proper to do, that in a condition of health each separate biped and each individual leg is required to perform an equal and uniform function and to carry an even or equal portion of the weight of the body, it will be readily appreciated that the result of this distribution will be a regular, evenly balanced, and smooth displacement of the body thus supported by the four legs, and that therefore, according to the rapidity of the motion in different gaits, each single leg will be required at certain successive moments to bear the weight which had rested upon its congener while it was itself in the air, in the act of moving; or, again, two different legs of a biped may be called upon to bear the weight of the two legs of the opposite biped while also in the air in the act of moving.

To simplify the matter by an illustration, the weight of an animal may be placed at 1,000 pounds, of which each leg, in a normal and healthy condition, supports while at rest 250 pounds. When one of the fore legs is in action, or in the air, and carrying no weight, its 250 pounds share of the weight will be thrown upon its congener, or partner, to sustain. If the two legs of a biped are both in action and raised from the ground, their congeners still resting in inaction, will carry the total weight of the other two, or 500 pounds. And as the succession of movements continues, and the change from one leg to another or from one biped to another, as may be required by the gait, proceeds, there will result a smooth, even, and equal balancing of active movements, shifting the weight from one leg or one biped to another, with symmetrical precision, and we shall be presented with an interesting example of the play of vital mechanics in a healthy organization.

Much may be learned from the accurate study of the action of a single leg. Normally, its movements will be without variation or failure. When at rest it will easily sustain the weight assigned to it, without showing hesitancy or betraying pain, and when it is raised from the ground in order to transfer the weight to its mate, it will perform the act in such a manner that when it is again placed upon the ground to rest it will be with a firm tread, indicative of its ability to receive again the burden to be thrown back upon it. In planting it upon the ground or raising it up again for the forward movement while in action, and again replanting it upon the earth, each movement will be the same for each leg and for each biped, whether the act be that of walking or trotting, or even of galloping. In short, the regular play of every part of the apparatus will testify to the existence of that condition of orderly soundness and efficient activity eloquently suggestive of the condition of vital integrity, which is simply but comprehensively expressed by the terms health and soundness.

But let some change, though slight and obscure, occur among the elements of the case; some invisible agency of evil intrude among the harmonizing processes going forward; any disorder occur in the relations of co-operating parts; anything appear to neutralize the efficiency of vitalizing forces; any disability of a limb to accept and to throw back upon its mate the portion of the weight which belongs to it to sustain—present itself, whether as the effect of traumatic accidents or otherwise; in short, let anything develop which tends to defeat the purpose of nature in organizing the locomotive apparatus, at once we are confronted by that which may be looked upon as a cause of lameness.

Not the least of the facts which it is important to remember is that it is not sufficient to look for the manifestation of an existing discordance in the action of the affected limb alone, but that it is shared by the sound one, and must be searched for in that as well as the halting member, if the hazard of an error is to be avoided. The mode of action of the leg which is the seat of the lameness will vary greatly from that which it exhibited when in a healthy condition, and the sound leg will also offer important modifications in the same three particulars before alluded to, to wit, that of resting on the ground, that of its elevation and forward motion, and that of striking the ground again when the full action of stepping is accomplished. Inability in the lame leg to sustain weight will imply excessive exertion by the sound one, and lack of facility or disposition to rest the lame member on the ground will necessitate a longer continuance of that action on the sound side. Changes in the act of elevating the leg, or of carrying it forward, or in both, will present entirely opposite conditions between the two. The lame member will be elevated rapidly, moved carefully forward, and returned to the ground with caution and hesitancy, and the contact with the earth will be effected as lightly as possible, while the sound limb will rest longer on the ground, move boldly and rapidly forward, and strike the ground promptly and forcibly. All this is due to the fact that the sound member carries more than its normal, healthy share of the weight of the body, a share which may be in excess from 1 to 250 pounds, and thus bring its burden to a figure varying from 251 to 500 pounds, all depending upon the degree of the existing lameness, whether it is simply a slight tenderness or soreness, or whether the trouble has reached a stage which compels the patient to the awkwardness of traveling on three legs.

That all this is not mere theory, but rests on a foundation of fact may be established by observing the manifestations attending a single alteration in the balancing of the body. In health the support and equilibrium of that mass of the body which is borne by the fore legs is equalized, and passes by regular alternations from the right to the left side and *vice versa*. But if the left leg, becoming disabled, relieves itself by leaning, as it were, on the right, the latter becomes, consequently, practically heavier, and the mass of the body will incline or settle upon that side. Lameness of the left side; therefore, means dropping or settling on the right, and *vice versa.* We emphasize this statement and insist upon it, the more from the frequency of the instances of error which have come under our notice, in which parties have insisted upon their view that the leg which is the seat of the lameness is that upon which he drops, and which the animal is usually supposed to favor.

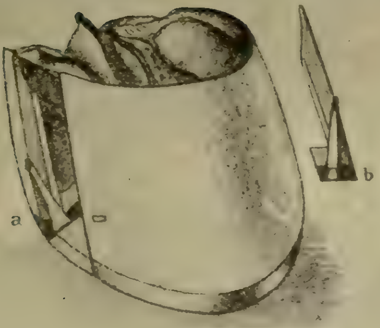
HOW TO DETECT THE SEAT OF LAMENESS.

Properly appreciating the remarks which have preceded, but little remains to be done in order to reach an answer to the question as to which side of the animal the lameness is seated, except to examine the patient while in action. We have already stated our reasons for preferring the movement of trotting for this purpose. In conducting such an examination the animal should be unblanketed, and held by a plain halter in the hands of a man who knows how to manage his paces, and the trial should always be made over a firm, hard road whenever such is available. He is to be examined from various positions—from before, from behind, and from each side. Watching him as he approaches, as he passes by, and as he recedes, the observer should carefully study that important action which we have spoken of as the dropping of the body upon one extremity or the other, and this can readily be detected by attending closely to the motions of the head and of the hip. The head drops on the same side on which the mass of the body will fall, dropping toward the right when the lameness is in the left fore leg, and the hip dropping in posterior lameness, also on the sound leg, the reversal of the conditions, of course, producing reversed effects. In other words, when the animal in trotting exhibits signs of irregularity of action, or lameness, and this irregularity is accompanied by dropping or nodding the head, or depressing the hip on the right side of the body, at the time the feet of the right side strike the ground, the horse is lame on the left side. If the dropping and nodding are on the near side the lameness is on the off side.

But in a majority of cases the answer to the first question relating to the lameness of a horse is, after all, not a very difficult task. There are two other problems in the case more difficult of solution and which often require the exercise of a closer scrutiny, and draw upon all the resources of the experienced practitioner to settle satisfactorily. That a horse is lame in a given leg may be easily determined, but when it becomes necessary to pronounce upon the query as to what part, what region, what structure is affected, the easy part of the task is over, and the more difficult and important, because more obscure, portion of the investigation has commenced—except, of course, in cases of which the features are too distinctly evident to the senses to admit of error. It is true that by carefully noting the manner in which a lame leg is performing its functions, and closely scrutinizing the motions of the whole extremity, and especially of the various joints which enter into its structure; by minutely examining every part of the limb; by observing the outlines; by testing the change, if any, in temperature and the state of the sensibility—all these investigations may guide the surgeon to a correct localiza-

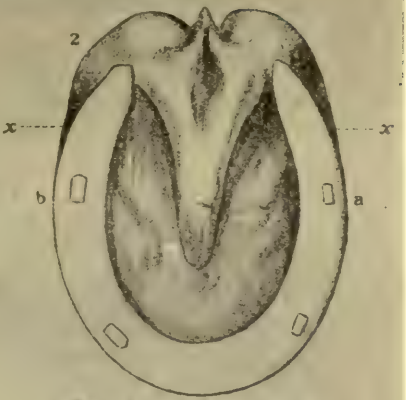
1 2 and 3. *Sound foot of two year old.*

1



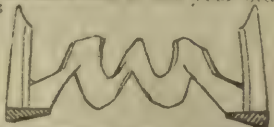
a Nail properly driven
b Nail improperly driven

2



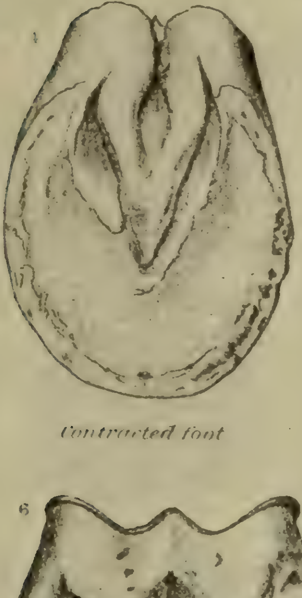
Sound foot of two year old

3



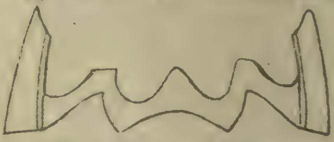
4a *Section across fig 2, at* x.

4



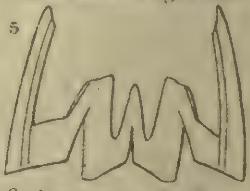
Contracted foot

4a



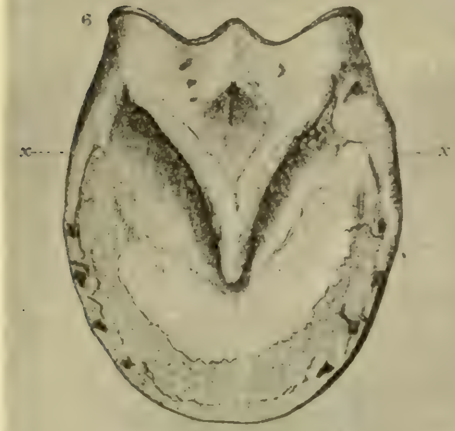
Section across fig. 6 at x.

5



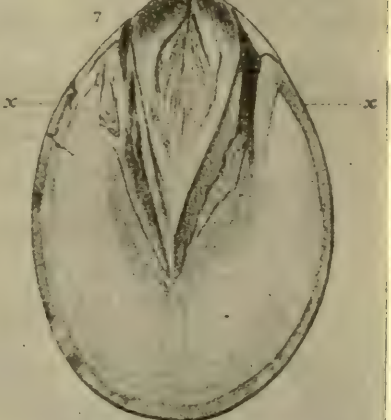
Section across fig. 7 at x.

6



Sound but flat foot

7



Badly contracted foot.

SOUND AND CONTRACTED FEET.

tion of the seat of trouble, but he must carefully refrain from the adoption of a hasty conclusion, and, above all, assure himself that he has not failed to make the foot, of all the organs of the horse the most liable to injury and lesion, the subject of the most thorough and minute examination of all the parts which compose the suffering extremity.

The greater liability of the foot than of any other part of the extremities to injury from casualties, natural to its situation and use, should always suggest the beginning of an inquiry, especially in an obscure case of lameness at that point. Indeed the lameness may have an apparent location elsewhere when that is the true seat of the trouble, and the surgeon who, while examining his lame patient, discovers a ringbone, and satisfying himself that he has encountered the cause of the disordered action suspends his investigation without subjecting the foot to a close scrutiny, may deeply regret his neglect and inadvertence at a later day, when regrets will avail nothing toward remedying the irreparable injury which has ensued upon his partial method of exploration. But, as in human pathological experience, there are instances when inscrutable diseases will deliver their fatal messages while leaving no mark and making no sign by which they might be identified and classified, so it will happen that in the humbler animals the onset and progress of mysterious and unrecognizable ailments will at times baffle the most skilled veterinarian, and leave our burden-bearing servants to succumb to the inevitable, and suffer and perish in unrelieved distress.

DISEASES OF BONES.

Periostitis, Ostitis, and Exostosis.—From the closeness and intimacy of the connection existing between the two principal elements of the bony structure while in health, it frequently becomes exceedingly difficult, when a state of disease has supervened, to discriminate accurately as to the part primarily affected, and to determine positively whether the periosteum or the body of the bone is originally implicated. Yet a knowledge of the fact is often of the first importance, in order to secure a favorable result from the treatment to be instituted. It is, however, quite evident that in a majority of instances the bony growths which so frequently appear on the surface of their structure, to which the general term of exostosis is applied, have had their origin in an inflammation of the periosteum, or enveloping membrane, and known as periostitis. However this may be, we have as a frequent result, sometimes on the body of the bone, sometimes at the extremities, and sometimes involving the articulation itself, certain bony growths, or exostoses, known otherwise by the term splint, ringbone, and spavin, all of which, in an important sense, may be finally referred to the periosteum as their nutrient source and support, at least after their formation, if not for their incipient existence.

Cause.—It is certain that inflammation of the periosteum is frequently referable to wounds and bruises caused by external agencies, and it is also true that it may possibly result from the spreading inflammation of surrounding diseased tissues, but in any case the result is uniformly seen in the deposit of a bony growth, more or less diffuse, sometimes of irregular outline, and at others projecting distinctly from the surface from which it springs, as so commonly presented in the ringbone and the spavin.

Symptoms.—This condition of periostitis is often difficult to determine. The signs of inflammation are so obscure, the swelling of the parts so insignificant, any increase of heat so imperceptible, and the soreness so slight, that even the most acute observer may fail to locate the point of its existence, and it is often long after the discovery of the disease itself that its location is positively revealed by the visible presence of the exostosis. Yet the first question had been resolved, in discovering the fact of the lameness, while the second and third remained unanswered, and the identification of the affected limb and the point of origin of the trouble remained unknown until their palpable revelation to the senses.

Treatment.—When, by careful scrutiny, the ailment has been located, a resort to treatment must be had at once, in order to prevent, if possible, any further deposit of the calcareous structure and increase of the exostotic growth. With this view the application of water, either warm or cold, rendered astringent by the addition of alum or sugar of lead, will be beneficial. The tendency to the formation of the bony growth, and the increase of its development after its actual formation, may often be checked by the application of a severe blister of Spanish fly. The failure of these means and the establishment of the diseased process in the form of chronic periostitis cause various changes in the bone covered by the disordered membrane, and the result may be softening, degeneration, or necrosis, but more usually it is followed by the formation of the bony growths referred to, on the canon bone, the coronet, the hock, etc.

SPLINTS.

We first turn our attention to the splint, as certain bony enlargements which are developed on the canon bone, between the knee or the hock and the fetlock joint, are called. They are found on the inside of the leg, from the knee, near to which they are frequently found, downward to about the lower third of the principal canon bone. They are of various dimensions and are readily perceptible both to the eye and to the touch. They vary considerably in size, ranging from that of a large nut downward to very small proportions. In searching for them they may be readily detected by the hand if they have attained sufficient development in their usual situation, but must be distinguished from a small bony enlargement which may be felt at the lower third of the canon bone, which is neither a splint nor a pathological formation of any kind, but merely the buttonlike enlargement at the lower extremity of the small metacarpal or splint bone.

We have said that splints are to be found on the inside of the leg. This is true as a general statement, but it is not invariably so, and they occasionally appear on the outside. It is also true that they appear most commonly on the fore legs, but this is not exclusively the case, and they may at times be found on both the inside and outside of the hind leg. Usually a splint forms only a true exostosis, or a single bony growth, with a somewhat diffuse base, but neither is this invariably the case. In some instances they assume more important dimensions, and pass from the inside to the outside of the bone, on its posterior face, between that and the suspensory ligament. This form is termed the pegged splint, and constitutes a serious and permanent deformity, in consequence of its interference with the play of the fibrous cord which passes behind it, becoming thus a source of continual irritation and consequently of permanent lameness.

Symptoms.—A splint may thus frequently become a cause of lameness though not necessarily in every instance; but it is a lameness possessing features peculiar to itself. It is not always continuous, but at times assumes an intermittent character, and is more marked when the animal is warm than when he is cool. If the lameness is near the kneejoint, it is very apt to become aggravated when the animal is put to work, and the gait acquires then a peculiar character, arising from the manner in which the limb is carried outward from the knees downward, which is done by a kind of abduction of the lower part of the leg. Other symptoms, however, than the lameness and the presence of the splint, which is its cause, may be looked for in the same connection as those which have been mentioned as pertaining to certain evidences of periostitis, in the increase of the temperature of the part, with swelling and probably pain on pressure. This last symptom is of no little importance, since its presence or absence has in many cases formed the determining point in deciding a question of difficult diagnosis.

Cause.—A splint being one of the results of periostitis, and the latter one of the effects of external hurts, it naturally follows that the parts which are most exposed to blows and collisions will be those on which the splint will most commonly be found, and it may not be improper, therefore, to refer to hurts from without as among the common causes of the lesion. But other causes may also be productive of the evil, and among these may be mentioned the overstraining of an immature organism by the imposition of excessive labor upon a young animal at a too early period of his life.

Treatment.—It is, of course, the consideration of the comparative harmlessness of splints that suggests and justifies the policy of noninterference, except as they become a positive cause of lameness. And a more positive argument for such noninterference consists in the fact that any active and irritating treatment may so excite the parts as to bring about a renewed pathological activity, which may result in a reduplication of the phenomena.

Of course, there will be exceptional conditions which will at times indicate a different course. These will become evident when the occasions present themselves, and extraordinary forms and effects of inflammation and growth in the tumors offer special indications. But our conviction remains unshaken that surgical treatment of the operative kind is usually useless, if not dangerous. We have little faith in the method of extirpation except under very special conditions, among which that of diminutive size has been named, which seems in itself to constitute a sufficient negative argument. But even in such a case a resort to the knife or the gouge could scarcely find a justification, since no operative procedure is ever without a degree of hazard, to say nothing of the considerations which are always forcibly negative in any question of the infliction of pain and the unnecessary use of the knife.

If an acute periostitis of the canon bone has been readily discovered, the treatment we have already suggested for that ailment is at once indicated, and the astringent lotions may be relied upon to bring about beneficial results. Sometimes, however, preference may be given to a lotion possessing a somewhat different quality, the alterative consisting of tincture of iodine applied to the inflamed spot several times daily. If the lameness persists under this mild course of treatment, it must, of course, be attacked by other methods, and we must resort to the cantharides ointment or Spanish-fly blister. Besides this, and producing an analogous effect, the compounds of biniodide of mercury are favored by some. It is prepared in the form of an ointment, consisting of 1 dram of the biniodide to 1 ounce of either lard or vaseline. It forms an excellent blistering and alterative application, and is of special advantage in newly formed or recently discovered exostosis.

It remains a pertinent query, however, and one which seems to be easily answered, whether a tumor so diminutive in size that it can only be detected by diligent search, and which is neither a disfigurement nor an obstruction to the motion of the limb, need receive any recognition whatever. Other modes of treatment for splints are recommended and practiced which belong strictly to the domain of operative veterinary surgery. Among these are to be reckoned actual cauterization, or the application of the fire iron and the operation of periosteotomy. These are frequently indicated in the treatment of splints which have resisted milder means.

The mode of the development of their growth; their intimacy, greater or less, with both the large and small canon bones; the possibility of their extending to the back of these bones under the suspensory ligament; the dangerous complications which may follow the rough handling of the parts, with also a possibility, and indeed a probability, of their return after removal—these are the considerations which have influenced our judgment in discarding from our practice and our approval the method of removal by the saw or the chisel, as recommended by certain European veterinarians.

SIDEBONES.

A sidebone consists in a transformation of the lateral cartilages found on the wings of the coffin bone into bony matter by the deposition of lime salts. The disease is a common one, especially in heavy horses used for draft, in cavalry horses, cow ponies, and other saddle horses, and in runners and trotters. Sidebones are peculiar to the fore feet, yet they occasionally develop in the hind feet, where they are of little importance since they cause no lameness. In many instances sidebones are of slow growth and, being unaccompanied by acute inflammation, they cause no lameness until such time as, by reason of their size, they interfere with the action of the joint.

Causes.—Sidebones often grow in heavy horses without any apparent injury, and their development has been attributed to the overexpansion of the cartilages caused by the great weight of the animal. Blows and other injuries to the cartilages may set up an inflammatory process which ends in the formation of these bony growths. High-heeled shoes, high calks, and long feet are always classed among the conditions which may excite the growth of sidebones. They are often seen in connection with contracted heels, ringbones, navicular disease, punctured wounds of the foot, quartercracks, and occasionally as a sequel to founder.

Symptoms.—In the earlier stages of the disease, if inflammation is present, the only evidence of the trouble to be detected is a little fever over the seat of the affected cartilage and a slight lameness. In the lameness of sidebones the toe of the foot first strikes the ground and the step is shorter than natural. The subject comes out of the stable stiff and sore, but the gait is more free after exercise.

Since the deposit of bony matter often begins in that part of the cartilage where it is attached to the coffin bone, the diseased process may exist for some time before the bony growth can be seen or felt. Later on, however, the cartilage can be felt to have lost its elastic character, and by standing in front of the animal a prominence of the coronary region at the quarters can be seen. Occasionally these bones become so large as to bulge the hoof outward, and by pressing on the joint they so interfere with locomotion that the animal becomes entirely useless.

Treatment.—So soon as the disease can be diagnosed active treatment should be adopted. Cold-water bandages are to be used for a few days to relieve the fever and soreness. The improvement consequent on the use of these simple measures often leads to the belief that the disease has recovered; but with a return to work the lameness, fever, etc., reappears. For this reason the use of blisters, or, better still, the firing iron, should follow on the discontinuance of the cold bandages. But in many instances no treatment will arrest the growth of these bony tumors, and as a palliative measure neurotomy must be resorted to. Generally this operation will so relieve the pain of locomotion that the patient may be used for slow work; but in animals used for fast driving or for saddle purposes, the operation is practically useless.

RINGBONE.

A ringbone is the growth of a bony tumor on the ankle. This tumor is, in fact, not the disease, but simply the result of an inflammatory action set up in the periosteum and bone tissue proper of the pastern bones.

Causes.—Injuries, such as blows, sprains, overwork in young, undeveloped animals, fast work on hard roads, jumping, etc., are among the principal exciting causes of ringbone. Horses most disposed to this disease are those with short, upright pasterns, for the reason that the shock of locomotion is but imperfectly dissipated in the forelegs of these animals. Improper shoeing, such as the use of high calks, a too great shortening of the toe and correspondingly high heels, predispose to this disease by increasing the concussion to the feet.

Symptoms.—The first symptom of an actively developed ringbone is the appearance of a lameness more or less acute. If the bony tumor forms on the side or upper parts of the large pastern, its growth is generally unattended with acute inflammatory action, and consequently produces no lameness or evident fever. These are called false ringbone. But when the tumors form on the whole circumference of the ankle, or simply in front under the extensor tendon, or behind under the flexor tendons, or if they involve the joints between the two pastern bones, or between the small pastern and the coffin bone, the lameness is always severe. These constitute the true ringbone. Besides lameness, the ankle of the affected limb presents more or less heat, and in many instances a rather firm, though limited, swelling of the deeper tissues over the seat of the inflammatory process. The lameness of ringbone is characteristic in that the heel is first placed on the ground when the disease is in a fore leg, and the ankle is kept as rigid as possible. In the hind leg, however, the toe strikes the ground first, when the ringbone is high on the ankle, just as in health, but the ankle is maintained in a rigid position. If the bony growth is under the front tendon of the hind leg, or if it involves the coffin joint, the heel is brought to the ground first. In the early stages of the disease it is not always easy to diagnose ringbone, but when the deposits have reached some size they can be felt and seen as well.

The importance of a ringbone depends on its seat and often on its size. If it interferes with the joints or with the tendons it may cause an incurable lameness, even though small. If it is on the sides of the large pastern, the lameness generally disappears as soon as the tumor has reached its growth and the inflammation subsides. Even where the pastern joint is involved, if complete anchylosis results, the patient may recover from the lameness with simply an imperfect action of the foot remaining, due to the stiff joint.

Treatment.—Before the bony growth has commenced the inflammatory process may be cut short by the use of cold baths and wet bandages, followed by one or more blisters. If the bony deposits have begun the firing iron should always be used. Even where the tumors are large and the pastern joint involved firing often hastens the process of anchylosis and should always be tried.

Where the lower joint is involved or where the tumor interferes with the action of the tendons recovery is not to be expected. In many of these latter cases, however, the animal may be made serviceable by proper shoeing. If the patient walks with the toe on the ground the foot should be shod with a high-heeled shoe and short toe. On the other hand, if he walks on the heel, a thick-toed and thin-heeled shoe must be worn. Since ringbone is considered to be one of the hereditary diseases, no animal suffering from this trouble should ever be used for breeding purposes.

SPAVIN.

This affection, popularly termed *bone spavin,* is an exostosis of the hock joint. The general impression is that in a spavined hock the bony growth should be seated on the anterior and internal part of the joint, and this is partially correct, as such a growth will constitute a spavin in the most correct sense of the term. But an enlargement may appear on the upper part of the hock also, or possibly a little below the inner side of the lower extremity of the shank bone, forming what is known as a *high spavin;* or, again, the growth may form just on the outside of the hock and become an *outside,* or external, spavin. And, finally, the entire under surface may become the seat of the osseous deposit, and involve the articular face of all the bones of the hock, and this again is a bone spavin. There would seem, then, to be but little difficulty in comprehending the nature of a bone spavin, and there would be none but for the fact that there are similar affections which might confuse one if the diagnosis is not very carefully made.

But the hock may be spavined, while to all outward observation it still retains its perfect form. With no enlargement perceptible to sight or touch the animal may yet be disabled by an occult spavin, an anchylosis in fact, which has resulted from a union of several of the bones of the joint, and it is only those who are able to realize the importance of its action to the perfect fulfillment of the function of locomotion by the hind leg who can comprehend the gravity of the only prognosis which can be justified by the facts of the case—a prognosis which is essentially a sentence of serious import in respect to the future usefulness and value of the animal. For no disease, if we except those acute inflammatory attacks upon vital organs to which the patient succumbs at once, is more destructive to the usefulness and value of a horse than a confirmed spavin. Serious in its inception, serious in its progress, it is an ailment which, when once established, becomes a fixed condition which there is no known means of dislodging.

Cause.—The periostitis, of which it is nearly always a termination, is usually the effect of a traumatic cause operating upon the complicated structure of the hock, such as a sprain which has torn a ligamentous insertion and lacerated some of its fibers; or a violent effort in jumping, galloping, or trotting, to which the victim has been compelled by the torture of whip and spur while in use as a gambling implement by a sporting owner, under the pretext of improving his breed; or the extra exertion of starting an inordinately heavy load; or an effort to recover his balance from a misstep; or slipping upon an icy surface; or sliding with worn shoes upon a bad pavement, and other kindred causes. And we can repeat here what we have before said concerning bones, in respect to heredity as a cause. From our own experience we know of equine families in which this condition has been transmitted from generation to generation, and animals otherwise of excellent conformation rendered valueless by the misfortune of a congenital spavin.

Symptoms.—The evil is one of the most serious character for other reasons, among which may be specified the slowness of its development and the insidiousness of its growth. Certain indefinite phenomena and alarming changes and incidents furnish usually the only portents of approaching trouble. Among these signs may be mentioned a peculiar posture assumed by the patient while at rest, and becoming at length so habitual that it can not fail to suggest the action of some hidden disorder. The posture is due to the action of the adductor muscles, the lower part of the leg being carried inward, and the heel of the shoe resting on the toe of the opposite foot. Then an unwillingness may be noticed in the animal to move from one side of the stall to the other. When driven he will travel, but stiffly, and with a sort of sidelong gait between the shafts, and after finishing his task and resting again in his stall will pose with the toe pointing forward, the heel raised, and the hock flexed. Some little heat and a considerable amount of inflammation soon appear. The slight lameness which appears when backing out of the stall ceases to be noticeable after a short distance of travel.

The characteristic lameness or bone spavin, as it affects the motion of the hock joint, presents two aspects. In one class of cases it is most pronounced when the horse is cool, in the other when he is at work. The first is characterized by the fact that when the animal travels the toe first touches the ground, and the heel descends more slowly, the motion of flexion at the hock taking place stiffly, and accompanied by a dropping of the hip on the opposite side. In the other case the peculiarity is that the lameness increases as the horse travels; that when he stops he seeks to favor the lame leg, and when he resumes his work soon after he steps much on his toe, as in the first variety.

An excellent test for spavin lameness, which may be readily applied, consists in lifting the affected leg off the ground for one or two minutes and holding the foot high so as to flex all the joints. An assistant, with the halter strap in his hand, quickly starts the animal off in a trot, when, if the hock joint is affected, the lameness will be so greatly intensified as to readily lead to a diagnosis.

Treatment.—To consider a hypothetical case: An early discovery of lameness has been made; that is, the existence of an acute inflammation—of periostitis—has been detected. The increased temperature of the parts has been observed, with the stiffened gait and the characteristic pose of the limb, and the question is proposed for solution, What is to be done? Even with only these comparatively doubtful symptoms—doubtful with the nonexpert—we should direct our treatment to the hock in preference to any other joint, since of all the joints of the hind leg it is this which is most liable to be attacked, a natural result from its peculiarities of structure and function. And in answer to the query, What is the first treatment indicated? We should answer *rest*—emphatically, and as an essential condition, *rest.* Whether only threatened, suspected, or positively diseased, the animal must be wholly released from labor, and it must be no partial or temporary quiet of a few days. In all stages and

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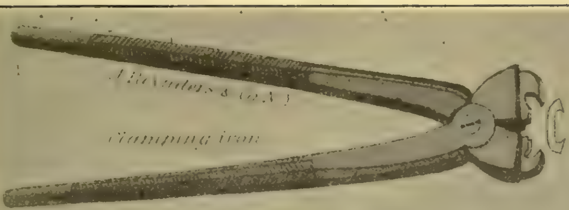
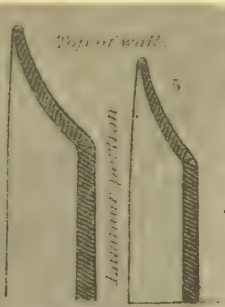

J. Reynders & Co. N.Y.

Clamping iron.

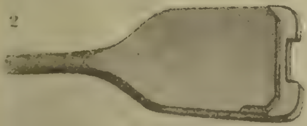
4

5



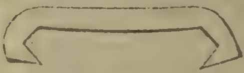
Actual thickness of walls of hoof.

2



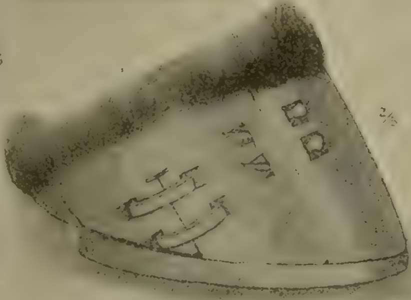
Iron for burning holes.

3



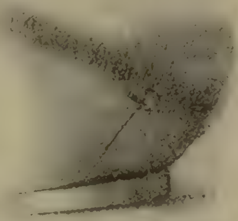
Clamp.

6



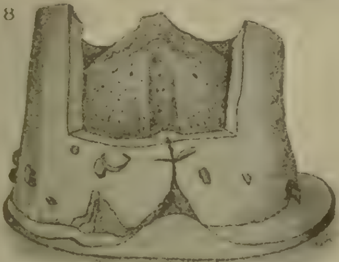
The clamp and nail remedies applied.

7



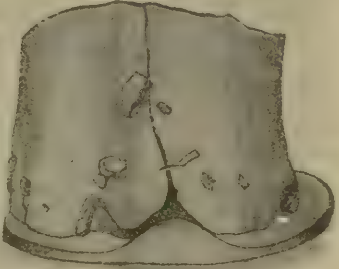
Quarter crack with cross-cut.

8



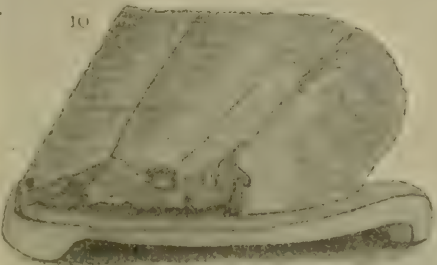
Toe crack. Wall removed to show absorption of coffin bone.

9



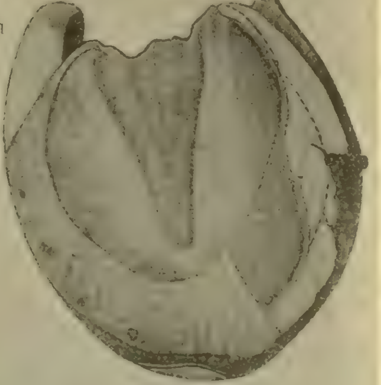
Treated by clamping with nails.

10



Cracked walls.

11



Old effect of Quarter crack.

QUARTER-CRACK AND REMEDIES. HORSE BOOK, B. A. I.

conditions of the disease, whether the spavin is nothing more than a simple exostosis, or whether accompanied by the complication of arthritis, there must be a total suspension of effort until the danger is over. Less than a month's quiet ought not to be thought of—the longer the better.

Good results may also be expected from local applications. The various lotions which cool the parts, the astringents which lower the tension of the blood vessels, the tepid fomentations which accelerate the circulation in the engorged capillaries, the liniments of various composition, the stimulants, the opiate anodynes, the sedative preparations of aconite, the alterative frictions of iodine—all these are recommended and prescribed by one or another. We prefer counterirritants, for the simple reason, among many others, that they tend by the promptness of their action to prevent the formation of the bony deposits. The lameness will often yield to the blistering action of cantharides, in the form of ointment or liniment, and to the alterative preparations of iodine or mercury. And if the owner of a spavined horse really succeeds in removing the lameness, he has accomplished all that he is justified in hoping for; beyond this let him be well persuaded that a cure is impossible.

For this reason, moreover, he will do well to be on his guard against the patented cures which the traveling horse doctor may urge upon him, and withhold his faith from the circular of the agent who will deluge him with references and certificates. It is possible that nostrums may in some exceptional instances prove serviceable, but the greater number of them are capable of producing only injurious effects. The removal of the bony tumor can not be accomplished by any such means, and if a trial of these unknown compounds should be followed by complications no worse than the establishment of one or more ugly, hairless cicatrices, it will be well for both the horse and his owner.

Rest and counterirritation, with the proper medicaments, constitute, then, the prominent points in the treatment designed for the relief of bone spavin. Yet there are cases in which all the agencies and methods referred to seem to lack effectiveness and fail to produce satisfactory results. Either the rest has been prematurely interrupted or the blisters have failed to rightly modify the serous infiltration, or the case in hand has some undiscernible characteristics which seem to have rendered the disease neutral to the agencies employed against it. An indication of more energetic means is then presented, and free cauterization with the firing iron becomes necessary. At this point a word of explanation in reference to this operation of firing may be appropriate for the satisfaction of any among our readers who may entertain an exaggerated idea of its severity and possible cruelty.

The operation is one of simplicity, but is nevertheless one which, in order to secure its benefits, must be reserved for times and occasions of which only the best knowledge and highest discretion should be allowed to judge. It is not the mere application of a hot iron to a given part of the body which constitutes the operation of firing. It is the methodical and scientific introduction of heat into the structure with a view to a given effect upon a diseased organ or tissue by an expert surgeon. The first is one of the degrees of mere burning. The other is scientific cauterization, and is a surgical manipulation which should be committed exclusively to the practiced hand of the veterinary surgeon.

Either firing alone or stimulation with blisters is of great efficacy for the relief of lameness from bone spavin. Failure to produce relief after a few applications and after allowing a sufficient interval of rest should be followed by a second, or, if needed, a third firing. In case of further failure there is a reserve of certain special operations which have been tried and recommended, among which those of cunean tenotomy, periosteotomy, the division of nervous branches, etc., may be mentioned. These, however, belong to the peculiar domain of the veterinary practitioner, and need not now engage our attention.

FRACTURES.

In technical language a fracture is a "solution of continuity in the structure or substance of a bone." It ranks among the most serious of the lesions to which the horse—or any animal—can be subject. Though of less serious consequence in the horse than in man, it is always a matter of grave import. It is always slow and tedious in healing, and is frequently of doubtful and unsatisfactory result.

Treatment.—Considered, *per se,* a fracture in an animal is in fact no less amenable to treatment than the same description of injury in any other living being. But the question of the propriety and expediency of treatment is dependent upon certain specific points of collateral consideration.

The nature of the lesion itself is a point of paramount importance. A simple fracture occurring in a bone where the ends can be firmly secured in coaptation presents the most favorable conditions for successful treatment. If it be that of a long bone, it will be the less serious if situated at or near the middle of its length than if it were in close proximity to a joint, from the fact that perfect immobility can rarely, in the latter case, be secured without incurring the risk of subsequent rigidity of the joint.

In respect to the utilization of the animal, the most obvious point in estimating the gravity of the case in a fracture accident is the certainty of the total loss of the services of the patient during treatment—certainly for a considerable period of time; perhaps permanently. For example, the fracture of the jaw of a steer just fattening for the shambles will involve a heavier loss than a similar accident to a horse. Usually the fracture of the bones of the extremities in a horse is a very serious casualty, the more so proportionately as the higher region of the limb is affected. In working animals it is exceedingly difficult to treat a fracture in such a manner as to restore a limb to its original perfection of movement. A fracture of a single bone of an extremity in a breeding stallion or mare will not necessarily impair their value as breeders. Other specifications under this head, though pertinent and more or less interesting, may be omitted.

Age and temper are important factors of cure. A young, growing, robust patient whose *vis vitæ* is active is amenable to treatment which one with a waning constitution and past mature energies would be unable to endure; and a docile, quiet disposition will act co-operatively with remedial measures which would be neutralized by the fractious opposition of a peevish and intractable sufferer.

The fulfillment of three indications is indispensable in all fractures. The first is the reduction, or the replacement, of the parts as nearly as possible in their normal position. The second is their retention in that position for a period sufficient for the formation of the provisional callus, and the third, which, in fact, is but an incident of the second, the careful avoidance of any accidents or causes of miscarriage which might disturb the curative process.

In reference to the first consideration, it must be remembered that the accident may befall the patient at a distance from his home, and his removal becomes the first duty to be attended to. Of course, this must be done as carefully as possible. If he can be treated on the spot, so much the better, though this is seldom practicable, and the method of removal becomes the question calling for settlement. But two ways present themselves—he must either walk or be carried. If the first, it is needless to say that every caution must be observed in order to obviate additional pain for the suffering animal and to avoid any aggravation of the injury. Led slowly, and with partial support, if practicable, the journey will not always involve untoward results. If he is carried, it must be by means of a wagon, a truck, or an ambulance; the latter, being designed and adapted to the purpose, would, of course, be the preferable vehicle. As a precaution which should never be overlooked, a temporary dressing should first be applied. This may be so done as for the time to answer all the purpose of the permanent adjustment and bandaging. Without thus securing the patient, a fracture of an inferior degree may be transformed to one of the severest kind, and, indeed, a curable changed to an incurable injury.

To obtain complete immobility is scarcely possible, and the surgeon must be content to reach a point as near as possible to that which is unattainable. For this reason, as will subsequently be seen, the use of slings and the restraint of patients in very narrow stalls is much to be preferred to the practice sometimes recommended of allowing entire freedom of motion by turning them loose in box stalls. Temporary and movable apparatus are not usually of difficult use in veterinary practice, but the restlessness of the patients and their unwillingness to submit quietly to the changing of the dressings render it obligatory to have recourse to permanent and immovable bandages, which should be retained without disturbance until the process of consolidation is complete.

The materials composing the retaining apparatus consist of oakum, bandages, and splints, with an agglutinating compound which forms a species of cement by which the different constituents are blended into a consistent mass to be spread upon the surface covering the locality of the fracture. Its components are black pitch, rosin, and Venice turpentine, blended by heat. The dressing may be applied directly to the skin, or a covering of thin linen may be interposed. A putty made with powdered chalk and the white of egg is recommended for small animals, though a mixture of sugar of lead and burnt alum with the albumen is preferred by others. Another formula is spirits of camphor, Goulard's extract, and albumen. Another recommendation is to saturate the oakum and bandages with an adhesive solution formed with gum arabic, dextrin, flour paste, or starch. This is advised particularly for small animals, as is also the silicate of soda. Dextrin mixed, while warm, with burnt alum and alcohol cools and solidifies into a stony consistency, and is preferable to plaster of Paris, which is less friable and has less solidity, besides being heavier and requiring constant additions as it becomes older. Starch and plaster of Paris form another good compound.

In applying the dressing the leg is usually padded with a cushion of oakum, thick and soft enough to equalize the irregularities of the surface and to form a bedding for the protection of the skin from chafing. Over this the splints are placed. The material for these is, variously, pasteboard, thin wood, bark, laths, gutta percha, strips of thin metal, as tin or perhaps sheet iron. These should be of sufficient length not only to cover the region of the fracture, but to extend sufficiently above and below to render the immobility more complete than in the surrounding joints. The splints, again, are covered with cloth bandages, linen preferably, soaked in a glutinous mixture. These bandages are to be carefully applied, with a perfect condition of lightness. They are usually made to embrace the entire length of the leg, in order to avoid the possibility of interference with the circulation of the extremity, as well as for the prevention of chafing. They should be rolled from the lower part of the leg upward, and carefully secured against loosening. In some instances suspensory bandages are recommended, but excepting for small animals our experience does not justify a concurrence in the recommendation.

These permanent dressings always need careful watching with reference to their immediate effect upon the region they cover, especially during the first days succeeding that of their application. Any manifestation of pain, or any appearance of swelling above or below, or any odor suggestive of suppuration should excite suspicion, and a thorough investigation should follow without delay. The removal of the dressing should be performed with great care, and especially so if time enough has elapsed since its application to allow of a probability of a commencement of the healing process or the existence of any points of consolidation. With the original dressing properly applied in its entirety in the first instance, the entire extremity will have lost all chance of mobility, and the repairing process may be permitted to proceed without interference. There will be no necessity and there need be no haste for removal or change except under special conditions as have just been mentioned, or when there is reason to judge that solidification has become perfect, or for the comfort of the animal, or for its readaptation in consequence of the atrophy of the limb from want of use. Owners of animals are often tempted to remove a splint or bandage prematurely at the risk of producing a second fracture in consequence of the failure of the callus properly to consolidate.

The method of applying the splints which we have described refers to the simple variety only. In a compound case the same rules must be observed, with the modification of leaving openings through the thickness of the dressing, opposite the wound, in order to permit the escape of pus and to secure access to the points requiring the application of treatment.

FRACTURE OF THE RIBS.

The different regions of the chest are not equally exposed to the violence to which fractures of the ribs are due, and they are therefore either more common or more easily discovered during life at some points than at others. The more exposed regions are the middle and the posterior, while the front is largely covered and defended by the shoulder. A single rib may be the seat of fracture, or a number may be involved, and there may be injuries on both sides of the chest at the same time. It may take place lengthwise, in any part of the bone, though the middle, being the most exposed, is the most frequently hurt. Incomplete fractures are usually lengthwise, involving a portion only of the thickness or one or other of the surfaces. The complete kind may be either transverse or oblique, and are most commonly denticulated. The fracture may be comminuted, and a single bone may show one of the complete and one of the incomplete kind at different points. The extent of surface presented by the thoracic region, with its complete exposure at all points, explains the liability of the ribs to suffer from all the forms of external violence.

Symptoms.—In many instances fractures of these bones continue undiscovered, especially the incomplete variety, without displacement, though the evidences of local pain, a certain amount of swelling, and a degree of disturbance of the respiration, if noticed during the examination of a patient, may suggest a suspicion of their existence. Abnormal mobility and crepitation are difficult of detection, even when present, and they are not always present. When there is displacement the deformity which it occasions will betray the fact, and when such an injury exists the surgeon will, of course, become vigilant, in view of possible and probable complications of thoracic trouble, and prepare himself for an encounter with a case of traumatic pleuritis or pneumonia. Fatal injuries of the heart are recorded.

Treatment.—Fractures with but a slight or no displacement need no reduction. All that is necessary is a simple application of a blistering nature as a preventive of inflammation or for its subjugation when present, and in order to excite an exudation which will tend to aid in the support and immobilization of the parts. At times, however, a better effect is obtained by the application of a bandage placed firmly around the chest, although, while this limits the motion of the ribs, it is apt to render the respiration more labored.

If there is displacement, with much accompanying pain and evident irritation of the lungs, the fracture must be reduced without delay. The means of effecting this vary according to whether the displacement is outward or inward. In the first case the bone may be straightened by pressure from without, while in the second the end of the bone must be raised by a lever, for the introduction of which a small incision through the skin and intercostal spaces will be necessary. When coaptation has been effected it must be retained by the external application of adhesive mixture, with splints and bandages around the chest.

WINDGALLS.

This name is given to the dilated bursæ found at the posterior part of the fetlock joint. They have their origin in a dropsical condition of the bursæ of the joint itself, and also of the tendon which slides behind it, and are therefore further known by the designations of articular and tendinous windgalls, or puffs. They appear in the form of soft and somewhat symmetrical tumors, of varying dimensions, and generally well defined in their circumference. They are more or less tense, according to the amount of secretion they contain, apparently becoming softer as the foot is raised and the fetlock flexed. Usually they are painless and only cause lameness under certain conditions, as when they begin to develop themselves under the stimulus of inflammatory action, or when large enough to interfere with the functions of the tendons, or again where they have undergone certain pathological changes, such as calcification, which is among their tendencies.

Cause.—Windgalls may be attributed to external causes, such as severe labor or strains resulting from heavy pulling, fast driving, or jumping, or they may be among the sequelæ of internal disorders, such as strangles or the resultants of a pleuritic or pneumonic attack. An unnecessary amount of anxiety is sometimes experienced respecting these growths, with much questioning touching the expediency of their removal, all of which might be spared, for, while they constitute a blemish, their unsightliness will not hinder the usefulness of the animal, and in any case they rarely fail to show themselves easily amenable to treatment.

Treatment.—When in their acute stage, and when the dropsical condition is not excessive, the inflammation may be checked during the day by continuous cold water irrigation by means of a hose or soaking tub and at night by applying a moderately tight roller bandage. Later absorption may be promoted by a bandage of cloth drenched in warm water or a dripping bandage laid around the diseased part, then covered by several layers of woolen blanket or cloth, which is in turn covered by parchment paper, rubber cloth, or other impervious material. Heat, moisture, and pressure are obtained by such a bandage if water is poured upon it several times daily, also by roller bandages, sweating, the use of liniments, or if necessary by a sharp blister of biniodide of mercury. This treatment should subdue the inflammation, abort the soreness, absorb the excess of secretion, strengthen the walls of the sac, and finally cause the windgalls to disappear, provided the animal is not too quickly returned to labor and exposed to the same factors that occasioned them at first.

But if the inflammation has become chronic, and the enlargement has been of considerable duration, the negative course will be the wiser one. If any benefit results from treatment it will be of only a transient kind, the dilatation returning when the patient is again subjected to labor, and it will be a fortunate circumstance if inflammation has not supervened.

But notwithstanding the generally benignant nature of the swelling there are exceptional cases, usually when it is probably undergoing certain pathological changes, which may result in lameness and disable the animal, in which case surgical treatment will be indicated, especially if repeated blisters have failed to improve the symptoms. Line firing is then a pre-eminent suggestion, and many a useful life has received a new lease as the result of this operation timely performed. Another method of firing, which consists in emptying the sac by means of punctures through and through, made with a red-hot needle or wire, and the subsequent injection into the cavity of certain irritating and alterative compounds, designed to effect its closure by exciting adhesive inflammation, such as tincture of iodine, may be commended. But they are all too active and energetic in their effects and require too much special attention and intelligent management to be trusted to any hands other than those of an expert veterinarian.

BLOOD SPAVIN, BOG SPAVIN, AND THOROUGHPIN.

The blood spavin is situated in front and to the inside of the hock and is merely a varicose or dilated condition of the saphena vein. It occurs directly over the point where the bog spavin is found, and has thus been frequently confused with the latter. The complicated arrangement of the hock joint, and the powerful tendons which pass on the posterior part, are lubricated with the product of secretion from one tendinous synovial and several articular synovial sacs. A large articular sac contributes to the lubrication of the shank bone and one of the bones of the hock. The tendinous sac lies back of the articulation itself and extends upward and downward in the groove of that joint through which the flexor tendons slide. The dilatation of this articular synovial sac is what is denominated bog spavin, the term thoroughpin being applied to the dilatation of the tendinous capsule.

The bog spavin is a round, smooth, well-defined, fluctuating tumor situated in front and a little inward of the hock. On pressure it disappears at this point to reappear on the outside and just behind the hock. If pressed to the front from the outside it will then appear on the inside of the hock. On its outer surface it presents a vein which is quite prominent, running from below upward, and it is to the preternatural dilation of this blood vessel that the term blood spavin is applied. The thoroughpin is found at the back and on the top of the hock in that part known as the hollows, immediately behind the shank bone. It is round and smooth, but not so regularly formed as the bog spavin, and is most apparent when viewed from behind. The swelling is usually on both sides and a little in front of the so-called hamstring, but may be more noticeable on the inside or on the outside.

In their general characteristics bog spavins and thoroughpins are similar to windgalls, and one description of the origin, symptoms, pathological changes, and treatment will serve for all equally, except that it is possible for a bog spavin to cause lameness, and thus to involve a verdict of unsoundness in the patient, a circumstance which will, of course, justify its classification by itself as a severer form of a single type of disease. We have already referred to the subject of treatment and the means employed—rest, of course—with liniments, blisters, etc., and what we esteem as the most active and beneficial of any, early, deep, and well-performed cauterization.

OPEN JOINTS, BROKEN KNEES, SYNOVITIS, AND ARTHRITIS.

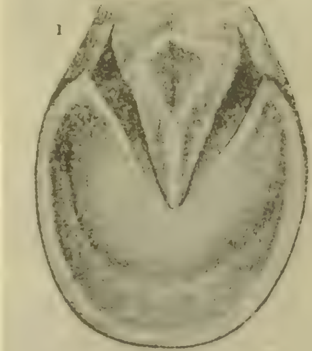
The close relationship which exists among these several affections, their apparently possible connection as successive developments of a similar, if not an essentially identical, origin, together with the advantage gained by avoiding frequent repetitions in the details of symptoms, treatment, etc., are our reasons for treating under a single head the ailments we have grouped together in the present section.

Cause.—The great, comprehensive, common cause of, sometimes permanent, sometimes only transient, disability of the horse is external traumatism. Blows, bruises, hurts by nearly every known form of violence, falls, kicks, lacerations, punctures—we may add compulsory speed in racing and cruel overloading of draft animals—cover the entire ground of causation of the diseases and injuries of the joints now receiving our consideration. In one case, a working horse making a misstep stumbles, and falling on his knees receives a hurt, variously severe, from a mere abrasion of the skin to a laceration, a division of the tegument, a slough, mortification, and the escape of the synovial fluid, with or without exposure of the bones and their articular cartilages.

In another case, an animal, from one cause or another, perhaps an impatient temper, has formed the habit of striking or pawing his manger with his fore feet until inflammation of the kneejoint is induced, first as a little swelling, diffused, painless; then as a periostitis of the bones of the knee; later as bony deposits, then lameness, and finally the implication of the joint, with all the various sequelæ of chronic inflammation of the kneejoint.

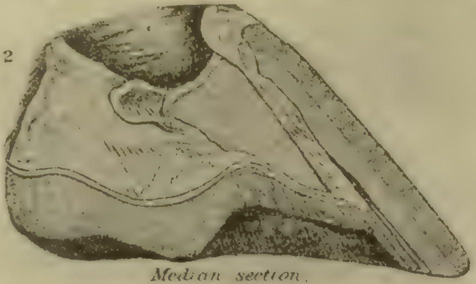
In another case, a horse has received a blow with a fork from a careless hostler on or near a joint, or has been kicked by a stable companion, with the result of a punctured wound, at first mild-looking, painless, apparently without inflammation, and not yet causing lameness, but which, in a few hours, or it may be only after a few days, becomes excessively painful, grows worse, the entire joint swells, presently discharges, and at last a case of suppurative synovitis is presented, with perhaps disease of the joint proper, and arthritis

1



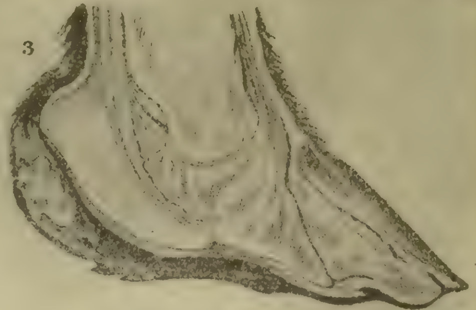
Foundered foot,
after Haubner

2



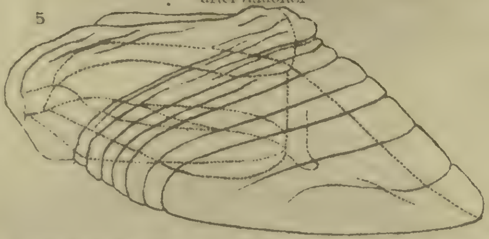
Median section,
after Haubner

3



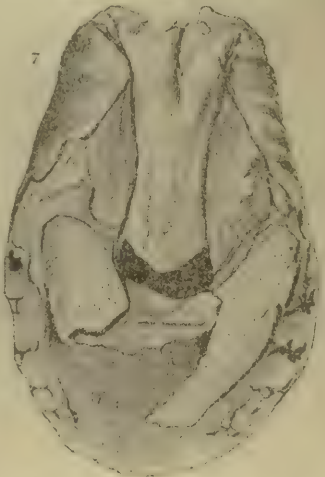
Median section,
after Percivall

5



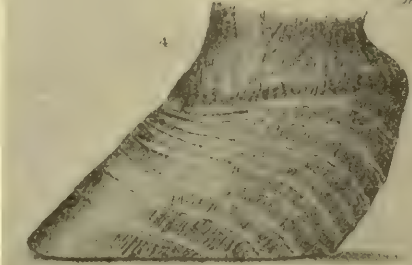
Skeleton of hoof showing cavity occupied by the foot.
(Original)

7



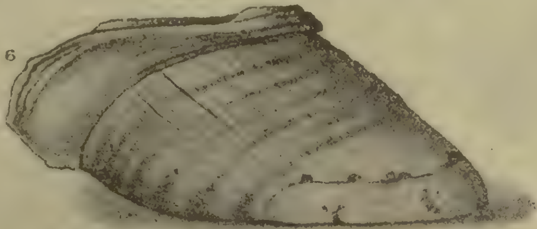
Bottom of foot shown in fig.6.
(Original)

4



Same foot as shown in fig 1.
(Original)

6



Same foot as shown in fig 7
(Original)

FOUNDERED FEET.

as a climax. The symptoms of articular injuries vary not only in the degrees of the hurt, but in the nature of the lesion.

Or the condition of broken knees, resulting as we have said, may have for its starting point a mere abrasion of the skin—a scratch, apparently, which disappears without a resulting scar. The injury may, however, have been more severe, the blow heavier, the fall aggravated by occurring upon an irregular surface, or sharp or rough object, with tearing or cutting of the skin, and this laceration may remain. A more serious case than the first is now brought to our notice.

Another time, immediately following the accident, or possibly as a sequel of the traumatism, the tendinous sacs may be opened, with the escape of the synovia; or worse, the tendons which pass in front of the knee are torn, the inflammation spreads, the joint and leg are swollen, the animal is becoming very lame; synovitis has set in. With this the danger becomes very great, for soon suppuration will be established, then the external coat of the articulation proper becomes ulcerated, if it is not already in that state, and we find ourselves in the presence of an open joint with suppurative synovitis—that is, with the worst among the conditions of diseased processes, because of the liability of the suppuration to become infiltrated into every part of the joint, macerating the ligaments and irritating the cartilages, soon to be succeeded by their ulceration, with the destruction of the articular surface—or the lesion of ulcerative arthritis, one of the gravest among all the disorders known to the animal economy.

But ulcerative arthritis and suppurative synovitis may be developed otherwise than in connection with open joints; the simplest and apparently the most harmless punctures may prove to be cause sufficient. For example, a horse may be kicked, perhaps, on the inside of the hock; there is a mark and a few drops of blood to indicate the spot, he is put to work, apparently free from pain or lameness, and performs his task with his usual ease and facility. But on the following morning the hock is found to be a little swollen and there is some stiffness. A little later on he betrays a degree of uneasiness in the leg, and shrinks from resting his weight upon it, moving it up and down for relief. The swelling has increased and is increasing, the pain is severe, and, finally, there is an oozing, at the spot where the kick impinged, of an oily liquid mixed with whitish drops of suppuration. The mischief is done; a simple, harmless, punctured wound has expended into a case of ulcerative arthritis and suppurative synovitis.

Treatment.—For simple bruises, like those which appear in the form of broken knees or of carpitis, simple remedies, such as warm fomentations or cold water applications and compresses of astringent mixtures, suggest themselves at once. Injuries of a more complicated character, as lacerations of the skin or tearing of soft structures, will also be benefited by simple dressings with antiseptic mixtures, as those of the carbolic acid order. The escape of synovia should suggest the prompt use of collodion dressings to check the flow and prevent the further escape of the fluid. But if the discharge is abundant and heavily suppurative, little can be done more than to put in practice the expectant method with warm fomentations, repeatedly applied, and soothing mucilaginous poultices. Improvement, if any is possible, will be but slow to manifest itself. The most difficult of all things to do, in view of varying interests and opinions—that is, in a practical sense—is to abstain from doing entirely, and yet we are firmly convinced that noninterference in the cases we are considering is the best and wisest policy.

In cases which are carried to a successful result the discharge will by degrees diminish, the extreme pain will gradually subside, and the convalescent will begin timidly to rest his foot upon the ground, and presently to bear weight upon it, and perhaps, after a long and tedious process of recuperation, he may be returned to his former and normal condition of usefulness. When the discharge has wholly ceased and the wounds are entirely healed, a blister covering the whole of the joint for the purpose of stimulating the absorption of the exudation will be of great service. But if, on the contrary, there is no amelioration of symptoms and the progress of the disease resists every attempt to check it; if the discharge continues to flow, not only without abatement, but in an increased volume, and not alone by a single opening, but by a number of fistulous tracts which have successively formed; if it seems evident that this drainage is rapidly and painfully sapping the suffering animal's vitality, and a deficient vis vitæ fails to co-operate with the means of cure—all rational hope of recovery may be finally abandoned. Any further waiting for chances, or time lost in experimenting, will be mere cruelty and there need be no hesitation concerning the next step. The poor beast is under sentence of death, and every consideration of interest and of humanity demands an anticipation of nature's evident intent in the quick and easy execution of the sentence.

One of the essentials of treatment, and probably an indispensable condition when recovery is in any wise attainable, is the suspension of the patient in slings. He should be continued in them as long as he can be made to submit quietly to their restraint.

DISLOCATIONS.

Dislocations and luxations are interchangeable terms, meaning the separation and displacement of the articulating surfaces of the bones entering into the formation of a joint. This injury is rarely encountered in our large animals on account of the combination of strength and solidity in the formation of their joints. It is met with but seldom in cattle and less so in horses, while dogs and smaller animals are more often the sufferers.

Cause.—The accident of luxation is less often encountered in the animal races than in man. This is not because the former are less subject to occasional violence involving powerful muscular contractions, or are less often exposed to casualities similar to those which result in luxations in the human skeleton, but because it requires the co-operation of conditions—anatomical, physiological, and perhaps mechanical—present in the human race and lacking in the others, which, however, can not in every case be clearly defined. Perhaps the greater relative length of the bony levers in the human formation may constitute a cause of the difference. Among the predisposing causes in animals may be enumerated caries of articular surfaces, articular abscesses, excessive dropsical conditions, degenerative softening of the ligaments, and any excessive laxity of the soft structures.

Treatment.—The treatment of luxations must, of course, be similar to that of fractures. Reduction, naturally, will be the first indication in both cases, and the retention of the replaced parts must follow. The reduction involves the same steps of extension and counter extension, performed in the same manner, with the patient subdued by anesthetics.

The difference between the reduction of a dislocation and that of a fracture consists in the fact that in the former the object is simply to restore the bones to their true normal position, with each articular surface in exact contact with its companion surface, the apparatus necessary afterwards to keep them in situ being similar to that which is employed in fracture cases, and which will usually require to be retained for a period of from forty to fifty days, if not longer, before the ruptured retaining ligaments are sufficiently firm to be trusted to perform their office unassisted. A variety of manipulations are to be employed by the surgeon, consisting in pushing, pulling, pressing, rotating, and indeed whatever movement may be necessary, until the bones are forced into such relative positions that the muscular contraction, operating in just the right directions, pulls the opposite matched ends together in true coaptation—a head into a cavity, an articular eminence into a trochlea, as the case may be. The setting is accompanied by a peculiar snapping sound, audible and significant, as well as a visible return of the surface to its normal symmetry.

Special Dislocations.—While all the articulations of the body are liable to this form of injury, there are three in the large animals which may claim a special consideration, viz.:

DISEASES OF MUSCLES AND TENDONS.

Sprains.—This term expresses a more or less complete laceration or yielding of the fibers of the muscles, tendons, or the sheaths surrounding and supporting them. The usual cause of a sprain is external violence, such as a fall or a powerful exertion of strength, with following symptoms of soreness, heat, swelling, and a suspension of function. Their termination varies from simple resolution to suppuration, and commonly fibrinous exudation difficult to remove. None of the muscles or tendons of the body are exempt from liability to this lesion, though naturally from their uses and the exposure of their situation the extremities are more liable than other regions to become their seat. The nature of the prognosis will be determined by a consideration of the seat of the injury and the complications likely to arise.

Treatment.—The treatment will resolve itself into the routine of local applications, including warm fomentations, stimulating liniments, counterirritation by blistering, and in some cases even firing. Rest, in the stable or in a box stall, will be of advantage by promoting the absorption of whatever fibrinous exudation may have formed, or absorption may be stimulated by the careful and persevering application of iodine in the form of ointments of various degrees of strength. There are many conditions in which not only the muscular and tendinous structures proper are affected by a strain, but, by contiguity of parts, the periosteum of neighboring bones may become involved, with a complication of periostitis and its sequelæ.

LAMENESS OF THE SHOULDER.

The frequency of the occurence of lameness in the shoulder from sprains entitles it to precedence of mention in the present category. For, though so well covered with its muscular envelope, it is often the seat of injuries which, from the complex structure of the region, become difficult to diagnosticate with satisfactory precision and facility. The flat bone which forms the skeleton of that region is articulated in a comparatively loose manner with the bone of the arm, but the joint is, notwithstanding, rather solid, and is powerfully strengthened by tendons passing outside, inside, and in front of it. Still, shoulder lameness or sprain may exist, originating in lacerations of the muscles, the tendons or the ligaments of the joint, or perhaps in diseases of the bones themselves. Slip of the shoulder is a phrase frequently applied to such lesions.

The identification of the particular structures involved in these lesions is of much importance, in view of its bearing upon the question of prognosis. For example, while a simple superficial injury of the spinatus muscles, or of the muscles by which the leg is attached to the trunk, may not be of serious import and may readily yield to treatment, or even recover spontaneously and without interference, the condition is quite changed when a case of tearing of the flexor brachii, or of its tendons as they pass in front of the articulation, occurs, or, what is still more serious, if there is inflammation or ulceration in the groove over which this tendon slides, or upon the articular surfaces or their surroundings, or periostitis at any joint adjacent.

Causes.—The frequency of attacks of shoulder lameness is not difficult to account for. The superficial and unprotected position of the part, and the numerous movements of which it is capable, and which in fact it performs, render it both subjectively and objectively pre-eminently liable to accident or injury. It would be difficult, nor would it materially avail, to enumerate all the forms of violence by which the shoulder may be crippled. A fall, accompanied by powerful concussion; a violent muscular contraction in starting a heavily loaded vehicle from a standstill; a misstep following a quick muscular effort; a jump accompanied by miscalculated results in alighting; a slip on a smooth, icy road; balling the feet with snow; colliding with another horse or other object—indeed, the list might be indefinitely extended, but it would be without profit or utility.

Symptoms.—Some of the symptoms of shoulder lameness are peculiar to themselves, and yet the trouble is frequently mistaken for other affections—navicular disease more often than any other. The fact that in both affections there are instances when the external symptoms are but imperfectly defined, and that one of them especially is very similar in both, is sufficient to mislead careless or inexperienced observers, and to occasion the error which is sometimes committed of applying to one disease the name of the other, erring both ways in the interchange. The true designation of pathological lesions is very far, at times, from being of certain and easy accomplishment, and, owing to the massive structure of the parts we are considering, this is especially true in the present connection. And still there are many cases in which there is really no reasonable excuse for an error in diagnosis by an average practitioner.

Shoulder lameness will of course manifest itself by signs and appearances more or less distinct and pronounced, according to the nature of the degree and the extent of the originating cause. We summarize some of these signs and appearances: The lameness is not intermittent but continued, the disturbance of motion gauging the severity of the lesion and its extent. It is more marked when the bones are diseased than when the muscles alone are affected. When in motion the two upper bony levers—the shoulder blade and the bone of the upper arm—are reduced to nearly complete immobility and the walking is performed by the complete displacement of the entire mass, which is dragged forward without either flexion or extension. The action of the joint below, as a natural consequence, is limited in its flexion. In many instances there is a certain amount of swelling at the point of injury—at the joint, or more commonly in front of it, or on the surface of the spinatus muscle. Again, instead of swelling there will be muscular atrophy, though while this condition of loss of muscular power may interfere with perfect locomotion, it is not in itself usually a cause of shoulder lameness. Sweenied shoulders are more often due to disease below the fetlock than to affections above the elbow.

During rest the animal often carries his leg forward, somewhat analogous to the pointing position of navicular disease, though in some cases the painful member drops at the elbow in a semiflexed position. The backing is sometimes typical, the animal when performing it, instead of flexing his shoulder, dragging the whole leg without motion in the upper segment of the extremity.

The peculiar manner in which the leg is brought forward in the air for another step in the act of walking or trotting is in some instances characteristic of injuries of the shoulder. The lameness also manifests itself in bringing the leg forward with a circumflex swinging motion, and shortening in the extension of the step. The foot is carried close to the ground and stumbling is frequent, especially on an uneven road.

With the utmost scrutiny and care the vagueness and uncertainty of the symptoms will contribute to perplex and discredit the diagnosis and embarrass the surgeon, and sometimes the expedient is tried of aggravating the symptoms by way of intensifying their significance, and thus rendering them more intelligible. This has been sought by requiring the patient to travel on hard or very soft ground and compelling him to turn on the sound leg as a pivot, with other motions calculated to betray the locality of the pain.

Treatment.—It is our conviction that lameness of the shoulder will in many cases disappear with no other prescription than that of rest. Provided the lesions occasioning it are not too severe, time is all that is required. But the negation of letting alone is seldom accepted as a means of doing good, in the place of the active and the positive form of treatment. This is in accordance with a trait of human nature which is universal, and is unlimited in its applications. Hence there must be something done. In mild cases of shoulder lameness, then, the indications are water, either in the cold douche or by showering, or by warm fomentations. Warm, wet blankets are of great service; and in addition, or as alternative, anodyne liniments, camphor, belladonna, either in the form of tincture or the oils, are of benefit, and at a later period stimulating friction with suitable mixtures, sweating liniments, blistering compounds, subcutaneous injections over the region of the muscle of 1½ grains of veratin (the variety insoluble in water) mixed in 2 drams of water, etc., will find their place, and finally, when necessity demands it, the firing iron and the seton.

The duration of the treatment must be determined by its effects and the evidence that may be offered of the results following the action of the reparative process. But the great essential condition of cure, and the one without which the possibility of relapse will always remain as a menace, is, as we have often reiterated in analogous cases, rest, imperatively rest, irrespective of any other prescriptions with which it may be associated.

SPRAIN OF THE ELBOW MUSCLES.

Causes.—This injury, which fortunately is not very common, is mostly encountered in cities, among heavy draft horses or rapidly driven animals which are obliged to travel, often smooth shod, upon slippery, icy, or greasy pavements, where they are easily liable to lose their foothold. The region of the strain is the posterior part of the shoulder, and the muscles which are affected are those which occupy the space between the posterior border of the scapula and the posterior face of the arm.

Symptoms.—The symptoms are easily recognized, especially when the animal is in action. While at rest the attitude may be normal, or by close scrutiny a peculiarity may perhaps be detected. The leg may seem to drop; the elbow may appear to be lower than its fellow, with the knee and lower part of the leg flexed and the foot resting on the toe, with the heel raised. Such an attitude, however, may be occasionally assumed by an animal without having any special significance. But when it becomes more pronounced on putting him in motion the fact acquires a symptomatic value, and this is the case in the present instance. A rapid gait becomes quite impossible, and the walk, as in some few other diseases, becomes sufficiently characteristic to warrant a diagnosis even when observed from a distance. An entire dropping of the anterior part of the trunk becomes manifest, and no weight is carried on the disabled side, in consequence of the loss of action in the suspensory muscles. There are often heat, pain, and swelling in the muscular mass at the elbow, though at times a hollow, or depression, may be observed near the posterior border of the scapula, which is probably the seat of injury. These hurts are of various degrees of importance, varying from mere minor casualties of quick recovery to lesions which are of sufficient severity to render an animal useless and valueless for life.

Treatment.—The prime elements of treatment, which should be strictly observed, are rest and quiet. Prescriptions of all kinds, of course, have their advocates. Among them are ether, chloroform, camphor, alcoholic frictions, warm fomentations, blisters, setons, etc. But unless the conclusions of experience are to be ignored, my own judgment is decisive in favor of rest, judiciously applied; and my view of what constitutes a judicious application of rest has been more than once presented in these pages. There are degrees of this rest. One contemplates simple immobility in a narrow stall. Another means the enforced mobility of the slings and a narrow stall as well. Another a box stall, with ample latitude as to posture and space, and option to stand up or lie down. As wide as this range may appear to be, radical recovery has occurred under all of these modified forms of letting our patients alone.

HIP LAMENESS.

The etiology of injuries and diseases of the hip is one and the same with that of the shoulder. The same causes operate and the same results follow. The only essential change, with an important exception, which would be necessary in passing from one region to the other in a description of its anatomy, its physiology, and its pathology, would be a substitution of anatomical names in reference to certain bones, articulations, muscles, ligaments, and membranes concerned in the injuries and diseases described. It would be only a useless repetition to cover again the ground over which we have so recently passed in recital of the manner in which certain forms of external violence (falls, blows, kicks, etc.) result in other certain forms of lesion (luxation, fracture, periostitis, ostitis, etc.), and to recapitulate the items of treatment and the names of the mendicaments proper to use. The same rules of diagnosis and the same indications and prognosis are applicable equally to every portion of the organism, with only such modifications in applying dressings and apparatus as may be required by differences of conformation and other minor circumstances, which must suggest themselves to the judgment of every experienced observer when the occasion arrives for its exercise.

There is an exception to be made, while considering the subject in connection with the region now under advisement, in respect to the formidable affection known as morbus coxarius, or hip-joint disease; and leaving the detail of other lesions to take their place under other heads, that relating to the shoulder, for instance, we turn to the hip joint and its ailments as the chief subject of our present consideration.

Symptoms.—In investigating for morbus coxarius, let the observer first examine the lame animal by scanning critically the outlines of the joint and the region adjacent for any difference of size or disturbance of symmetry in the parts, any prominence or rotundity and on both sides. The lame side will probably be warmer, more developed and fuller, both to the touch and to the eye. Let him then grasp the lower part of the leg (as he would in examining a case of shoulder lameness) and endeavor to produce excessive passive motion. This will probably cause pain when the leg is made to assume a given position. Let him push the thigh forcibly against the hip bone, and the contact will again probably cause a manifestation of pain. If the horse is trotted, the limited action of the hip joint proper and the excessive dropping and rising of the hip of the opposite side will be easily recognized. Usually the animal does not extend the foot as far as customarily and picks it up much sooner.

The abductive or circumflex motion observed in shoulder lameness is also present in hip lameness, but under special conditions, and the test of the difficulty, either by traveling on soft ground or in turning the horse in a circle, may here also contribute to the diagnosis, as in testing for lameness in the anterior extremity.

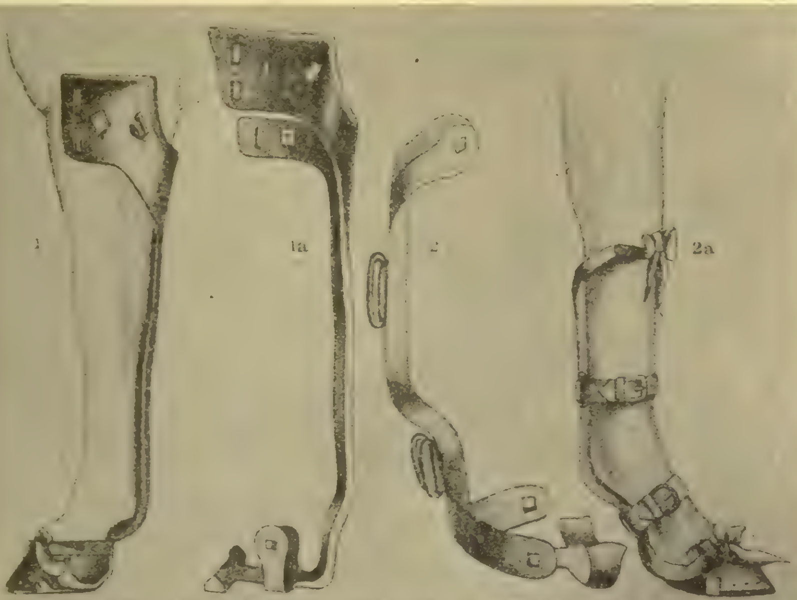
Prognosis.—The prognosis of hip lameness is at times quite serious, not only on account of the long duration of treatment required to effect good results, and because of the character which may be assumed by the disease, but of the permanence of the disability resulting from it. Exostosis and ulcerative arthritis are sequelæ which often resist every form of treatment.

Treatment.—As before intimated, this is little more than a repetition of the remarks upon the lameness of the shoulder, with slight modifications occasioned by the muscular structure of the hip, and we are limited to the same recommendations of treatment. The advantages of rest must be reaffirmed, with local applications, of which, however, it may be said that they are more distinctly indicated and likely to be more effective in their results than in shoulder lameness, and may be more freely employed, whether in the form of liniments, blisters (singly or repeated), firing, or setoning.

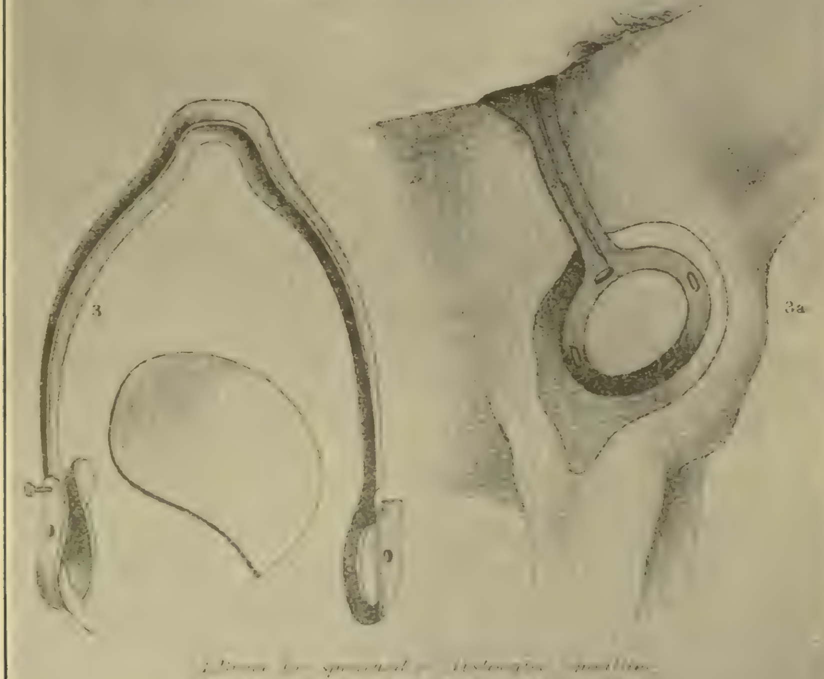
SPRAINS OF SUSPENSORY LIGAMENTS AND OF THE FLEXOR TENDONS OR THEIR SHEATH.

The fibrous structure situated behind the canon bones, both in the fore and hind legs, is often the seat of lacerations or sprains resulting from violent efforts or sudden jerks.

Cause.—The injury may be considered serious or trifling, according to the circumstances of each case as judged by its own history. Among the predisposing causes are a long thin fetlock and a narrow knee or hock as viewed from the side, with the flexor muscles tied in just below the joint. The longer and more oblique the pastern the greater is the strain on the flexor tendons and suspensory ligaments, hence a low quarter, a toe calk, and no heel calks, or a thin calk placed at the tip under the toe, and leaving the quarters long abnormally stretches the back tendons and causes a great strain upon them just before the weight is shifted from the foot in locomotion. In runners and hunters the disease is apt to be periodic. In driving horses it is most common in well-bred animals of nerv-



1 Brace for dislocation of the elbow applied to the horse. 1a. The same brace seen alone. 2. Brace for dislocation of fetlock. 2a. The same brace applied to the horse.



3 Brace for sprain or dislocation of shoulder.
3a The same brace applied to the shoulder.

Dislocation of Shoulder and Elbow. Bourgelaf's Apparatus. Horse Book, B. A. I.

ous temperament. Draft horses suffer most frequently in the hind legs.

Symptoms.—The injury is readily recognized by the changed aspect of the region and the accompanying local symptoms. The parts which in health are well defined, with the outlines of the tendons and ligaments well marked, become the seat of a swelling, more or less developed, from a small spot on the middle of the back of the tendon to a tumefaction reaching from the knee down to and even involving the fetlock itself. It is always characterized by heat, and it is variously sensitive, ranging from a mere tenderness to a degree of soreness which shrinks from the lightest touch. The degree of the lameness varies, and it has a corresponding range with the soreness, sometimes showing only a slight halting and at others the extreme of lameness on three legs, with intermediate degrees.

The lameness is always worse when the weight is thrown on the foot, and is most marked toward the end of the phase of contact with the ground. Either passive irritation of the leg or turning the animal in a circle causes pain as in diseases of the joints. Sometimes the horse likes to get the heels on a stone or some elevation so as to relieve the weight from the flexor tendors. Finally, in cases of long standing, a shortening of the tendons occurs, resulting in the abnormal flexion of the foot known by horsemen as broken down, or a more upright position of the foot may follow, producing perhaps knuckling or the so-called clubfoot.

Treatment.—The injured member should receive the earliest attention possible, not only when the inflammatory condition is present, but when it is subsiding and there is only the thickening of the ligaments, the tendons, or the sheath.

The most important remedy is rest, and the shoes should always be removed. During the first three days cold in the form of immersion or continuous irrigation is indicated. Then warm moisture and continuous pressure are advised. The latter is best applied by placing two padded splints about the thickness of the thumb along the two sides of the tendon and binding them in place with even pressure by bandage. Frequent bathing with warm soap suds is also beneficial. The absorption of the exudate may be promoted and the work of restoration effected by friction with alcohol, tincture of soap, spirits of camphor, mild liniments, strong sweating liniments, and blisters. An excellent ointment to apply with massage consists of equal parts of blue ointment and green soap, with double the quantity of vaseline. The action of blisters in these cases depends chiefly upon the massage used in applying them and upon the continuous pressure of the swollen skin on the inflamed tendons. In old cases more beneficial results will follow line firing. In these cases shoeing is very important. Leave the quarters long, shorten the toe, give the shoe rolling motion, and either put short heel calks on the branches or thicken the branches. Although this line of treatment is efficacious in many cases, there are others in which the thickening of the tendons refuses to yield and the changed tissues remain firmly organized, leaving them in the form of a thick mass resting upon the back part of the canon bone.

KNUCKLING OF FETLOCK.

As a consequence of the last-mentioned lesion of the tendons, a new condition presents itself in the articular disposition, constituting the deformity known as the knuckling fetlock. By this is meant a deformity of the fetlock joint by which the natural angle is changed from that which pertains to the healthy articulation. The first pastern, or suffraginis, loses its oblique direction and assumes another, which varies from the upright to the oblique, from before backward, and from above downward; in other words, forming an angle with its apex in front.

Causes.—This condition, as we have seen, may be the result of chronic disease producing structural changes in the tendons, and it may also occur as the result of other affections or some peculiarity independent of this and situated below the fetlock, such as ringbones, sidebones, or traumatic disease of the foot proper. Animals are sometimes predisposed to knuckling, such, for example, as are naturally straight in the pasterns, or animals which are compelled to labor when too young. The hind legs are more predisposed than the fore to this deformity, in consequence of the great amount of labor they are required to perform as the propelling levers of the body.

Symptoms.—The symptoms of knuckling are easily recognized. The changes in the direction of the bones vary more or less with the degree of the lesion, sometimes assuming such a direction that it almost becomes a true dislocation of the pastern. The effect of knuckling upon the gait also varies according to the degree of the deformity. As the different degrees of the shortening of the leg affect the motion of the fetlock, the lameness may be very slight or quite extreme. Another consequence of this shortening is such a change in the position of the foot that the heels cease to come in contact with the ground and assume a greater elevation, and the final result of this is soon witnessed in the development of a clubfoot.

Treatment.—To whatever cause the knuckling may be ascribed, it is always a severe infirmity, and there is but little room for hoping to overcome it unless it be during the very first stages of the trouble, and the hope dwindles to still smaller dimensions when it is secondary to other diseases below the fetlock. If it is caused by overworking the animal, the first indication will, of course, be rest. Line firing has proved very efficacious in these cases. The animal must be turned loose and left unemployed. Careful attention should be given to the condition of his feet and to the manner of shoeing, while time is allowed for the tendons to become restored to their normal state and the irritation caused by excessive stretching has subsided. A shoe with a thick heel will contribute to this. But if no improvement can be obtained and the tendons though retracted have yet been relieved of much of their thickening, the case is not a desperate one, and may yet be benefited by the operation of tenotomy, single or double—an operative expedient which must be committed to the experienced surgeon for its performance.

SPRUNG KNEES.

Though not positively the result of diseases of the tendons acting upon the knees, we venture to consider this deformity in connection with that which we have just described. It consists in such an alteration in the direction and articulation of the bones which form the various carpal joints that instead of forming a vertical line from the lower end of the forearm to the canon bone they are so united that the knee is more or less bent forward, presenting a condition due to the retraction of two of the principal muscles by which the canon bone is flexed.

Cause.—This flexion of the knee may be a congenital deformity and have continued from the foaling of the animal; or, like club-foot, it may be the result of heavy labor which the animal has been compelled to perform at too early an age. It may also be due to other diseases existing in parts below the kneejoint.

Symptoms.—This change of direction largely influences the movement of the animal by detracting from its firmness and practically weakening the entire frame, even to the extent of rendering him insecure on his feet and liable to fall. This condition of weakness is sometimes so pronounced that he is exposed to fall even when standing at rest and unmolested, the knees being unable even to bear the portion of the mere weight of the frame which belongs to them. This results in another trouble—that of being unable to keep permanently upright. He is apt to fall on his knees, and by this act becomes presently a sufferer from the lesion known by the term of broken knees.

Treatment.—Whatever may be the originating cause of this imperfection, it detracts very largely from the usefulness and value of a horse, disqualifying him for ordinary labor and wholly unfitting him for service under the saddle without jeopardizing the safety of his rider. If, however, the trouble is known from the start, and is not the result of congenital deformity or weakness of the knee-joint, or secondary to other diseases, rest, with fortifying frictions, may sometimes aid in strengthening the joints; and the application of blisters on the posterior part of the knee, from a short distance above to a point a little below the joint, may be followed by some satisfactory results; but with this trouble, as with knuckling fetlocks, the danger of relapse must be kept in mind as a contingency always liable to occur.

CURB.

This lesion is the bulging backward of the posterior part of the hock, where in the normal state there should be a straight line, extending from the upper end of the point of the hock down to the fetlock.

Cause.—The cause may be a sprain of the tendon which passes on the posterior part of the hock, or of one of its sheaths, or of the strong ligament situated on the posterior border of the os calcis. Hocks of a certain conformation seem to possess a greater liability to curb than others. They are overbent, coarse, and thick in appearance, or may be too narrow from front to back across the lower portion. This condition may therefore result as a sequence to congenital malformation, as in the case of horses that are saber-legged. It often occurs, also, as the result of violent efforts, of heavy pulling, of high jumping, or of slipping; in a word, it may result from any of the causes heretofore considered as instrumental in producing lacerations of muscular, tendinous, or ligamentous structure.

Symptoms.—A hock affected with curb, will, at the outset, present a swelling more or less diffuse on its posterior portion, with varying degrees of heat and soreness, and these will be accompanied by lameness of a permanent character. At a later period, however, the swell will become better defined, the deformity more characteristic, the prominent curved line readily detected, and the thickness of the infiltrated tissue easily determined by the fingers. At this time, also, there may be a condition of lameness, varying in degree, while at others, again, the irregularity of action at the hock will be so slight as to escape detection, the animal betraying no appearance of its existence.

A curb constitutes, by a strict construction of the term, an unsoundness, since the hock thus affected is less able to endure severe labor, and is more liable to give way with the slightest effort. And yet the prognosis of a curb can not be considered to be serious, since it generally yields to treatment, or at least the lameness it may occasion is generally easily relieved, though the loss of contour caused by the bulging will always constitute a blemish.

Treatment.—On the first appearance of the curb, when it exhibits the signs of acute inflammation, the first indication is to subdue this by the use of cold applications as intermittent or constant irrigation or an ice poultice; but when these have exhausted their effect and the swelling has assumed better defined boundaries, and the infiltration of the tendons or of the ligaments is all that remains of a morbid state, then every effort must be directed to the object of effecting its absorption and reducing its dimensions by pressure and other methods. The medicaments most to be trusted are blisters of cantharides and frictions with ointments of iodine, or, preferably, biniodide of mercury. Mercurial agents alone, by their therapeutic properties or by means of the artificial bandages which they furnish by the incrustations when their vesicatory effects are exhausted, will give good results in some instances by a single application, and often by repeated applications. The use of the firing iron must, however, be frequently resorted to, either to remove the lameness or to stimulate the absorption. We believe that its early application ought to be resorted to in preference to waiting until the exudation is firmly organized. Firing in dull points or in line will prove as beneficial in curb as in any other disease of a similar nature.

LACERATED TENDONS.

This form of injury, whether of a simple or of a compound character, may become a lesion of a very serious nature, and will usually require long and careful treatment, which may yet prove unavailing in consequence either of the intrinsically fatal character of the wound itself or the complications which have rendered it incurable.

Cause.—Like all similar injuries, these are the result of traumatic violence, such as contact with objects both blunt and sharp; a curbstone in the city; in the country, a tree stump or a fence, especially one of wire. It may easily occur to a runaway horse when he is whipped with fragments of harness or flogged by fragments of splintered shafts thrashing his legs, or by the contact of his legs with the wagon he has overturned and shattered with his heels while disengaging himself from its wreck.

Symptoms.—It is not always necessary that the skin should be involved in this form of injury. On the contrary, the tegument is frequently left entirely intact, especially when the injury follows infectious diseases or occurs during light exercise after long periods of rest in the stable. Yet, again, the skin may be cut through and the tendons nearly severed. A point a little above the fetlock is usually the seat of the injury. But irrespective of this, and whether the skin is or is not implicated, the symptoms very much resemble those of a fracture. There is excessive mobility, at least more than in a normal state, with more or less inability to carry weight. There may be swelling of the parts, and on passing the hands carefully along the tendon to the point of division the stumps of the divided structure will be felt more or less separated, perhaps wholly divided. The position of the animal while at rest and standing is peculiar and characteristic. While the heels are well placed on the ground, the toe is correspondingly elevated, with a tendency to turn up—a form of breaking down which was described when speaking of the fracture of the sesamoids. Carrying weight is done only with considerable difficulty, but with comparatively little pain, and the animal will unconsciously continue to move the leg as if in great suffering, notwithstanding the fact that his general condition may be very good and his appetite unimpaired.

The effect upon the general organism of compound lacerated wounds of tendinous structure, or those which are associated with injuries of the skin, are different. The wound becomes in a short time the seat of a high degree of inflammation with abundant suppuration, filling it from the bottom; and the tendon, whether as the result of the bruise or of the laceration, or of maceration in the accumulated pus, undergoes a process of softening, and necrosis and sloughing ensue. This complicates the case, and probably some form of tendinous synovitis follows, running into suppurative arthritis, to end, if close to a joint, with a fatal result.

Treatment.—As with fractures, and even in a greater degree, the necessity is imperative, in the treatment of lacerated tendons, to secure as perfect a state of immobility as can be obtained compatibly with the disposition of the patient; the natural opposition of the animal, sometimes ill-tempered and fractious at best, under the necessary restraint, causing at times much embarrassment to the practitioner in applying the necessary treatment. Without the necessary immobility no close connection of the ends of the tendons can be secured. To fulfill this necessary condition the posterior part of the foot and the fetlock must be supported and the traction performed by them relieved, an object which can be obtained by the use of the high-heeled and bar shoe, or possibly better accomplished with a shoe of the same kind extending about 2 or 2½ inches back of the heels. The perfect immobility of the legs is obtained in the same way as in the treatment of fracture, with splints, bandages, iron apparatus, plaster of adhesive mixtures, and similar means. So long as the dressings remain in place undisturbed, and no chafing or other evidence of pain is present, the dressings may be continued without changing, the patient being kept in the slings for a period sufficient to insure the perfect union of the tendons. But for a compound lesion, when there is laceration of the skin, some special care is necessary. The wound must be carefully watched and the dressings removed at intervals of a few days, or as often as may be needful, all of which additional manipulation and extra nursing, however indispensable, still adds to the gravity of the case and renders the prognosis more and more serious. When the tendons have sloughed in threads of various dimensions, or if in the absence of this process of mortification healthy granulation should form and fill up the wound, still very careful attention will be required, the granulating ends of the tendons having a tendency to bulge between the edges of the skin and to assume large dimensions, forming bulky excrescences or growths of a warty or cauliflower appearance, the removal of which becomes a troublesome matter.

The union of the tendons will at times leave a thickening of varying degree near the point of cicatrization, the absorption of which becomes an object of difficult and doubtful accomplishment, but which may be promoted by moderate blistering and the use of alterative and absorbent mixtures or perhaps the fire iron. A shoe with heels somewhat higher than usual will prove a comfort to the animal and aid in moderating and relieving the tension of the tendons.

SUNDRY ADDITIONAL AFFECTIONS OF THE EXTREMITIES.

Among these there are three which will principally occupy our attention, and these may be considered as forming a single group. In some parts of the legs may be found certain peculiar little structures of a saclike formation, containing an oily substance designed for the lubrication of the parts upon which they are placed for the purpose of facilitating the movements of the tendons which pass over them. These little sacs or muco-synovial capsules are liable under peculiar conditions of traumatism to become subject to a diseased process, which consists principally in a hypersecretion of their contents and an increase in dimensions, and they may undergo peculiar pathological changes of such a character as to disable an animal, and in many instances to cause serious blemishes which can not but depreciate his value. These growths, which are known as hygromata, may result from external violence, as blows or bruises, and may appear in the form of small, soft tumors, painless and not inflammatory in character, but, by a repetition of the cause or renewal of violence likely to acquire increased severity. Severe inflammation, with suppuration, may follow, which, filling up the cavity, the walls will become thickened and hard, resulting in the formation of a tumor. The elbow, the knee, and the hock are the parts of the body where these lesions are ordinarily found, and on account of their peculiar shape and the position they occupy they have received the denomination of capped. They will be considered in their peculiar aspect.

CAPPED ELBOW.

Capped elbow, or "shoe boil," is a term applied to an enlargement often found at the point of the elbow. This lesion is due to injury or pressure of the part while it is resting on the ground. The horse, unlike the cow, does not rest directly on the under surface of the sternum, or breastbone, on account of its sharp, ridgelike formation. He rests more on the side of the breastbone and chest, and consequently the leg which is flexed under the body is subject to considerable pressure. If the leg is flexed under the body so that the hoof or shoe is directly in contact with the elbow, which may occur in horses having an extremely long canon bone or excessive length in the shoes, the greater part of the weight of the chest is concentrated at this point and the pressure may cause a bruise or an inflammation.

Symptoms.—Under these conditions the point of the elbow may become swollen and tender and exhibit heat and pain. This swelling may not only cover the point of the elbow, but sometimes reaches the axilla and assumes such proportions that there is great difficulty in using the leg, the animal showing signs of lameness even to the extent of the circumflex step, as in shoulder lameness. This edematous condition, however, does not remain stationary. It may by degrees subside or perhaps disappear. In the first instance it will become more distinctly defined, with better marked boundaries, until it is reduced to a soft, round, fluctuating tumor, with or without heat or pain.

Various changes will follow the opening of the tumor and the escape of its contents. In a majority of cases the process of cicatrization will take place, and the cavity fill up by granulation, the discharge, at first abundant, gradually diminishing and the wound closing, usually without leaving any mark. At times, however, and especially if the disease has several times repeated its course, there may remain a pendulous sac, partly obliterated, which a sufficient amount of excitement or irritation may soon restore to its previous dimensions and condition.

In other cases an entirely different process takes place. The walls of the cavity, cyst, or abscess become ulcerated and thickened, the granulations of the sac become fibrous in their structure and fill up the cavity, and it assumes the character of a hard tumor on the back of the elbow, sometimes partly and sometimes entirely covered by the skin. It is fibrous in its nature, painless to the touch, well defined in its contour, and may vary in size from that of a small apple to that of a child's head.

This last form of capped elbow is the most serious of any, resisting all known forms of mild treatment, and removable by the knife only. The other forms, even that with the inflammatory aspect and its large edematous swelling which interferes with the work of the animal may justify a much milder prognosis, and, aside from their liability to recur, may be ranked with the comparatively harmless affections.

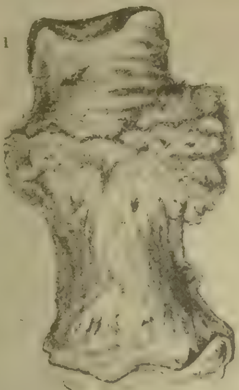
Treatment.—So long as the danger of recurrence is the principal bad feature of capped elbow the most important consideration is that of devising a means for its prevention. To prevent the animal from lying down is evidently the simplest method of keeping the heels and the elbow apart; but the impracticability of this prescription is apparent, since a majority of animals are obliged to lie down when they sleep, though it is true that a few take their sleep on their feet. The question of shoeing here enters into the discussion. The shortening of the inside branch of the shoe, which is the one with which the pressure is made, may be of advantage, and especially if the truncated end of the shoe is smooth and filed over to remove all possibility of pressure and contusion upon the skin. The protection of the skin of the elbow by interposing soft tissues between that and the shoe, or by bandaging the heel with bags or covering it with boots, is considered by many the best of the preventive methods, and the advantage to be secured by resorting to it can not be overlooked when the number of horses which develop shoe boil whenever the use of the boot is intermitted is considered. In order to prevent the animal from assuming the sternal decubitus, many give preference to the plan of fastening a piece of wood across the stall at some distance from the front wall or manger. It is a simple expedient, primitive, perhaps, but nevertheless practical and followed by good results.

CAPPED KNEE.

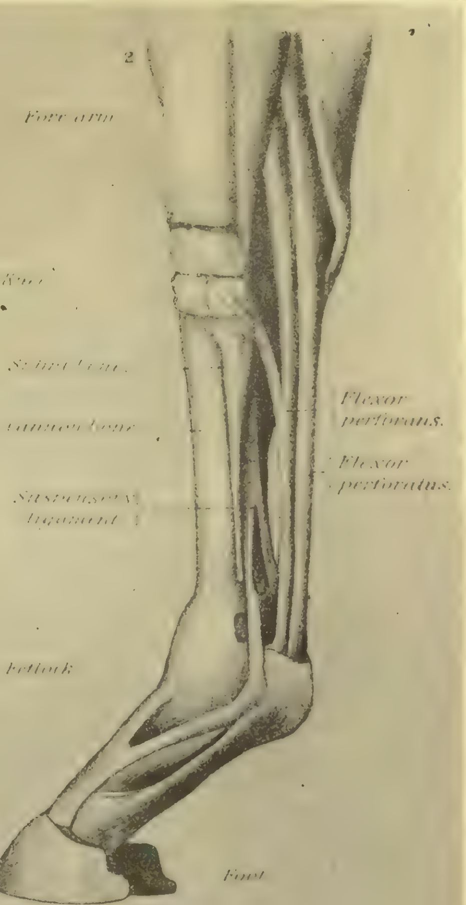
The passage of the tendons of the extensor muscle of the canon, as it glides in front of the kneejoint, is assisted by one of the little bursæ before mentioned, and when this becomes the seat of a dropsical collection a hygroma is formed and the knee is capped. Though somewhat analogous in its history to the capped elbow, there are points of difference between them. Their development may prove a source of great annoyance from the fact of the blemish which they constitute.

Cause.—The capped knee presents itself under various conditions. It is sometimes the result of a bruise or contusion, often repeated, inflicted upon himself by a horse addicted to the habit of pawing while in the stable and striking the front of the stall with his knees. Another class of patients is formed of those weak-kneed animals which are subject to falling and bruising the front of the joint against the ground, the results not being always of the same character.

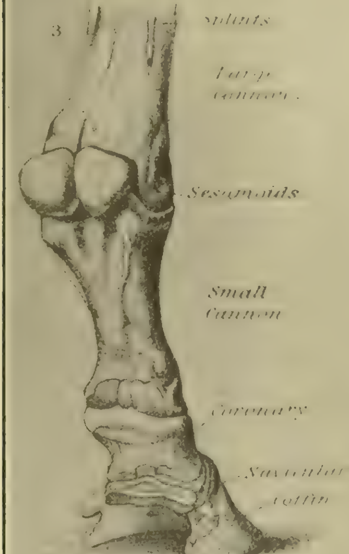
Symptoms.—The lesion may be a simple bruise, or it may be a severe contusion with swelling, edema, heat, and pain. The joint becomes so stiff and rigid that it interferes with the locomotion and



Ring Bone
after [illegible]



Anatomy of the Foot
after [illegible]



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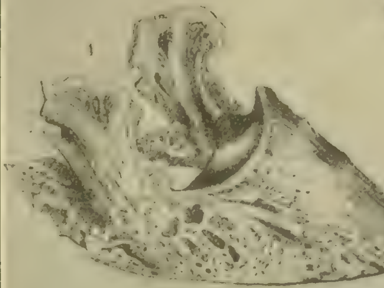
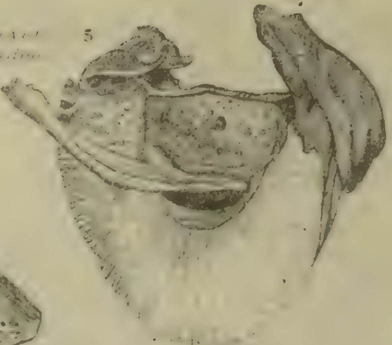


Side Bones
after Stonehenge



Navicular Disease
after Stonehenge

RINGBONE AND NAVICULAR DISEASE. HORSE BOOK, B. A. I.

yet under careful simple treatment the trouble may disappear. Or, again, instead of altogether passing off, the edema may diminish in extent, becoming more defined in form and remain as a swelling on the front part of the knee. Resulting from the crushing of small blood vessels, this is necessarily full of blood. The swelling is somewhat soft, diffuse, not painful, more or less fluctuating, and after a few days becomes crepitant under the pressure of the hand.

Instead of being filled with blood the swelling may be full of serum, as often occurs when violence, though perhaps slight, has been frequently repeated. In that case the swelling is generally well defined, soft, and painless, with more or less fluctuation, and it may even become pendulous. In other cases the swelling may be of an acute inflammatory nature with heat and pain, accompanied by stiffness of the joint. This leads to the formation of an abscess. Whatever the nature of these swellings may be, either full of blood, serum, or pus, some blemish usually remains after treatment.

Treatment.—Usually the first symptom of trouble is the edematous swelling on the front of the knee. The prevention of the inflammation and consequently of the abscess, is the prime object in view, and it may be realized by the use of warm water fomentations or compresses applied over the swelling, which may be used either in a simple form or combined with astringents, such as Goulard's extract, alum, or sulphate of zinc. The application of warm poultices of oil meal or ground flaxseed, enveloping the whole joint and kept in place by bandages, is often followed by absorption of the swelling, or, if the abscess is in process of formation, by the active excretion of pus.

CAPPED HOCK.

A bad habit prevails among some horses of rubbing or striking the partitions of their stalls with their hocks, with the result of an injury which shows itself on the upper point of that bone, the summit of the *os calcis.* From its analogy to the condition of capped elbow the designation of capped hock has been applied to this condition.

Symptoms.—A capped hock is therefore but the development of a bruise at the point of the hock, which if many times repeated may excite an inflammatory process, with all its usual external symptoms of swelling, heat, soreness, and the rest of the now familiar phenomena. The swelling is at first diffused, extending more or less on the exterior part of the hock, and in a few instances running up along the tendons and muscles of the back of the shank. Soon, however, unless the irritating causes are continued and repeated, the edema diminishes, and, becoming more defined in its external outlines, leaves the hock capped with a hygroma. The hygroma, at the very beginning of the trouble, contains a bloody serosity which soon becomes strictly serum, and this, through the influence of an acute inflammatory action, is liable to undergo a change which converts it into the usual purulent product of suppuration.

Treatment.—Capped hocks are in many cases amenable to treatment, and yet they often become the opprobrium of the practitioner by remaining, as they frequently do, an eyesore on the top of the hock; not interfering, it is true, with the work of the horse, but fixing upon him the stigma of what, in human estimation, is a most unreliable and objectionable reputation, to wit, that of being an habitual kicker, and, worse than all, one that kicks when he receives his provender.

The maxim that an ounce of prevention is worth a pound of cure fits the present case very neatly. A horse whose hocks have a somewhat puffy look and whose skin on the front of the hock is loose and flabby, justly subjects himself to a suspicion of his addictedness to this bad habit. But he may easily be either convicted or exonerated—a little watching will soon establish the truth. If, then, the verdict is one of conviction, precautions should be immediately adopted against a continuance of the evil. The padding of the sides of the stall with straw mats or mattresses and covering the posts with similar material, in such a manner that no hard surface shall be exposed with which to come in contact, will reduce the evil to its minimum. He may jar his frame when he kicks, but even then there will be less force in the concussion than if it impinged upon the solid plank, and cuts and abrasions can not be inflicted by a properly made cushion. Hobbles are also rightly recommended with a view to the required restraint of motion, so applied as to secure the leg with which the kicking is performed, or even both hind legs, in such a manner as shall not interfere with the movements of lying down and rising again and yet preventing that of kicking backward. Boots similar in pattern to those which are used for the prevention of shoe boil are also prescribed. These are placed above the hock and retained by straps tightly fastened. But we apprehend that the difficulty of retaining them in the proper place without the danger of chafing from the tightness of the straps might form an objection to their use. Notwithstanding all precautions, hocks will be capped in the future as in the past, and the study of their treatment will always be in order.

The mode of dealing with them will, of course, be greatly influenced by the condition of the parts. When the inflammation is excessive and the swelling large, hot, and painful to the touch, the application of warm water will be very beneficial. The leg should be well fomented several times a day, for from fifteen to twenty minutes each time, a strong decoction of marsh-mallow leaves being added to the water, and after each application swathed with flannel bandages soaked in the same warm mixture. A few days of this treatment will usually effect a resolution of the inflammation, if not complete, at least sufficiently so to disclose the correct outlines of the hygroma and exhibit its peculiar and specific symptoms. The expediency of its removal and the method of accomplishing it are then to be considered, with the question of opening it to give exit to its contents. If the fluid is of a purulent character the indication is in favor of its immediate discharge—no time should be lost, and it should be by means of a small opening made with a narrow bistoury. If, however, the fluid is a serosity, we prefer to remove it by punctures with a very small trocar. Our reason for special caution in these cases is our fear of the possibility of the existence of diseased conditions of a severe character in the pseudo joint. For the same reason we prefer the treatment of those growths by external applications. In the first stages of the disease a severe and stiff blister, such as the cantharidate of collodium, entirely covering the cyst, perhaps not yet completely formed, when the inflammation has subsided, will be of great benefit by its stimulating effect, the absorption it may excite, and the pressure which, when dry, it will maintain upon the tumor. If, however, the thickening of the growth fails to diminish, it should be treated with some of the iodine preparations in the form of ointments, pure or in combination with potassium, mercury, etc., of various strengths and in various proportions. A very satisfactory way to treat these cases is to burst the swelling by pressure from without. A strap or strong linen bandage is placed about the hock pressing on the bursa while the affected leg is on the ground, the other hind foot being lifted up. When the bandage is in place release the leg and the horse will violently flex the bandaged limb and produce pressure on the bursa with consequent bursting and discharging of its contents.

Whatever treatment may be adopted for capped hock, patience must be one of the ingredients. In these parts absorption is slow and the skin is very thick, and its return to a soft, pliable, natural condition, if effected at all, will only take place after weeks added to other weeks of medical treatment and patient waiting.

STRINGHALT.

This is an involuntary movement of one or both hind legs, in which the foot is suddenly and spasmodically lifted from the ground much higher than it is normally carried, with excessive flexion of one bone upon the other. This peculiarity is usually prominent, although it may disappear with work, only to reappear after a short rest. Sometimes it is most apparent at a trot, sometimes at a walk, and other times only when turned around; or it may not be affected by the gait of the horse. It does not seem to be influenced by the horse's age, young and old being alike affected. Its first manifestations are sometimes very slight. It has been noticed as occurring in an animal when backing out of his stable and ceasing immediately after. In some animals it is best seen when the animal is turning around on the affected leg, and it is not noticed when he moves straight forward. That this peculiar action interferes with facility of locomotion and detracts from a horse's claim to soundness can not for a moment be denied.

Cause.—Veterinarians and pathologists are yet in doubt in respect to the cause of this affection, as well as to its essential nature. Whether it results from disease of the hock, of an ulcerative character; whether it springs from a malformation; whether it is a shortening of the ligaments, a chronic inflammation of the sciatic nerve, or a disease of the spinal cord; whether it is purely a muscular or purely a nervous lesion, or a compound of both—it still continues, if an etiologist is bound to possess universal knowledge within the scope of his special studies, to be his opprobrium and his puzzle.

Treatment.—When there is a known or suspected cause the treatment should be directed toward this factor. If due to local inflammation of the hock or foot, only this local lesion should be treated. If it remains after the local lesion has healed, or if we have no assignable cause, the best results have followed the sectioning of the lateral extensor of the foot. A competent veterinarian alone should undertake this operation.

THROMBOSIS.

There are certain forms of lameness which are very peculiar in their manifestation, and which to the nonprofessional mind must appear to belong to the domain of mystery or theory instead of occupying a well-established position among the subjects of equine pathology. Yet they are no less susceptible of actual demonstration and of positive comprehension than many facts which, plain and familiar to the general understanding now, were once ranked among things occult and unsearchable. A thrombus, considered as a cause of lameness, may find a place among these understood mysteries.

Cause.—Under certain peculiar conditions of inflammation of the blood vessels, and also in aneurisms, clots of blood are sometimes formed in the arteries and find their way in the general circulation. At first, while very small, or sufficiently so to pass from one vessel to another, they move from a small vessel to a larger, and from that to one still larger, constantly increasing in size until at some given point, from their inability to enter smaller vessels, their movement is finally arrested. The artery is thus effectually dammed, and the clot in a short time cuts off completely the supply of blood from the parts beyond. This is thrombosis, and it often gives rise to sudden and excessive lameness of a very painful character.

Symptoms.—Thrombi may form in any of the arteries of the body, and doubtless have been the cause of many cases of lameness which could never be accounted for. If they exist in small arteries their diagnosis will probably fail to be made out with certainty, but when situated in the larger trunks a strong suspicion of their presence may be excited. In some cases they may even be recognized with positive accuracy, as when the vessels which supply the posterior extremities are affected by the blocking up of the posterior aorta or its ramifications.

The existence of thrombosis of the arteries of the hind leg may always be suspected when the following history is known: The general health of the animal is good, but symptoms of lameness in one of the legs have been developed, becoming more marked as he is worked, and especially when driven at a fast gait. But the disturbance is not permanent, and the lameness disappears almost immediately upon his being permitted to rest. There is an increase of the difficulty, however, and, though he may walk normally, he will, when made to trot, very soon begin to slacken his pace and to show signs of the trouble, and if urged to increase his speed will become lamer and lamer; an abundant perspiration will break out; he will refuse to go, and if forced he shows weakness behind, seems ready to fall, and perhaps does fall. While on his feet the leg is kept in constant motion, up and down, and is kept from the ground as if the contact was too painful to bear. If undisturbed this series of symptoms will gradually subside, sometimes very soon, and occasionally after a few hours he will return to an apparently perfect condition. A return to labor will lead to a renewal of the same incidents.

Treatment.—No form of treatment can be advised; and the suffering of a helpless and useless animal can only be terminated by that which ends all. Cases occur, however, where this condition of the blood vessels exists in a much less degree, and the diseased condition is not sufficiently pronounced for final condemnation. There may even be a possibility of the absorption of the clot, or that an increase of the collateral circulation may be sufficient to supply the parts with blood. In such cases spontaneous recovery may follow moderate exercise in the pasture, field, or stable, or continuous light work may be given, but too much hope should not be placed in such treatment.

SPRAINS OF THE LOINS.

This is an affection which suggests to the mind the idea of muscular injury, and is difficult to distinguish from many similar cases. If the animal shrinks from the slightest pressure or pinching of the spine in the region of the loins, he is by many pronounced to be lame in the loins, or sprained in the loins, or weak in the kidneys. This is a grave error, as in fact this simple and gentle yielding to such a pressure is not a pathological sign, but is normal and significant of health. Yet there are several conditions to which the definition of sprains of the loins may apply which are not strictly normal.

Cause.—The muscles of the back and those of the loins proper, as the psoas, may have been injured, or again there may be trouble of a rheumatic nature, perhaps suggestive of lumbago. Diseases of the bones of the vertebral column, or even those of the organs of circulation, may give rise to an exhibition of similar symptoms.

Symptoms.—The symptoms are characteristic of a loss of rigidity or firmness of the vertebral column, both when the animal is at rest and in action. In the former condition, or when at rest, there is an arched condition of the back and a constrained posture in standing, with the hind legs separated. In the latter there is a lateral, balancing movement at the loins, principally noticeable while the animal is in the act of trotting—a peculiar motion, sometimes referred to as a crick in the back. If, while in action, the animal is suddenly made to halt, the act is accompanied with much pain, the back suddenly arching or bending laterally, and perhaps the hind legs thrown under the body, as if unable to perform their functions in stopping, and sometimes it is only accomplished at the cost of a sudden and severe fall. This manifestation is also exhibited when the animal is called upon to back, when a repetition of the same symptoms will also occur.

If a slight pressure on the back or the loins is followed by a moderate yielding of the animal, it is, as before remarked, a good sign of health. With a sprain of the loins pressure of any kind is painful, and will cause the animal to bend or to crouch under it more or less, according to the weight of the pressure. Heavy loads, and even heavy harnessing, will develop this tenderness. In lying down he seems to suffer much discomfort, and often accompanies the act with groaning, and when compelled to rise does so only with great difficulty and seldom succeeds without repeated efforts.

Sprains of muscles proper, when recent, will always be accompanied by this series of symptoms, and the fact of their exhibition, with an excessive sensibility of the parts, and possibly with a degree of swelling, will always justify a diagnosis of acute muscular lesion; and especially so if accompanied by a history of violent efforts, powerful muscular strains, falls, heavy loading, etc., connected with the case. But if the symptoms have been of slow development and gradual increase, it becomes a more difficult task to determine whether the diagnosis points to pathological changes in the structure of the muscles or of the bones, the nervous centers, or the blood vessels of the region. And yet it is important to decide as to which particular structure is affected in reference to the question of prognosis, since the degree of the gravity of the lesion will depend largely upon whether the disabled condition of the animal is due to an acute or a chronic disease.

Treatment.—The prescription which will necessarily first of all suggest itself for sprains of the loins is rest. An animal so affected should be immediately placed in slings and none of his efforts to release himself should be allowed to succeed. Hot compresses, cold water douches, sweating application, stimulating frictions, strengthening charges, blistering ointments of cantharides and the actual cautery, all have their advocates; but in no case can the immobility obtained by the slings be dispensed with. In many cases electricity has also yielded good results, where the weakness of the hind quarters was caused by disease of the nervous centers.

FAULTS OF CONFORMATION.

A large percentage of horses have feet which are not perfect in conformation, and as a consequence of these imperfections they are especially predisposed to certain injuries and diseases.

Flatfoot is that condition in which the sole has little or no convexity. It is a peculiarity common to some breeds, especially heavy, lymphatic animals raised on low, marshy soils. It is confined to the forefeet, which are generally broad, low heeled, and with a wall less upright than is seen in the perfect foot.

In flatfoot there can be little or no elasticity in the sole, for the reason that it has no arch, and the weight of the animal is received on the entire plantar surface, as it rests upon the ground instead of on the wall. For these reasons such feet are particularly liable to bruises of the sole, corns, pumiced sole, and excessive suppuration when the process is once established. Horses with flatfoot should be shod with a shoe having a wide web, pressing on the wall only, while the heels and frog are never to be pared. Flatfoot generally has weak walls, and, as a consequence, the nails of the shoe are readily loosened and the shoe cast.

Clubfoot is a term applied to such feet as have the wall set nearly perpendicular. When this condition is present the heels are high, the fetlock joint is thrown forward, or knuckles, and the weight of the animal is received on the toes. Many mules are clubfooted, especially behind, where it seems to cause little or no inconvenience. Clubfoot may be cured by cutting the tendons in severe cases; but, as a rule, special shoeing is the only measure of relief that can be adopted. The toe should not be pared, but the heels are to be lowered as much as possible, and a shoe put on with a long projecting toe piece, slightly turned up, while the heels of the shoe are to be made thin.

Crookedfoot is that condition in which one side of the wall is higher than the other. If the inside wall is the higher, the ankle is thrown outward, so that the fetlock joints are abnormally wide apart and the toes close together. Animals with this deformity are pigeon-toed, and are prone to interfere, the inside toe striking the opposite fetlock. If but one foot is affected, the liability to interfere is still greater, for the reason that the fetlock of the perfect leg is more near the center plane.

When the outside heel is the higher the ankle is thrown in and the toe turns out. Horses with such feet interfere with the heel. If but one foot is so affected, the liability to interfere is less than where both feet are affected, for the reason that the ankle of the perfect leg is not so near to the center plane. Such animals are especially liable to stumbling and to lameness from injury to the ligaments of the fetlock joints. The deformity is to be overcome by such shoeing as will equalize the disparity in length of walls, and by proper boots to protect the fetlocks from interfering.

INTERFERING.

An animal is said to interfere when one foot strikes the opposite leg, as it passes by, during locomotion. The inner surface of the fetlock joint is the part most subject to this injury, although, under certain conditions, it may happen to any part of the ankle. It is seen more often in the hind than in the fore legs. Interfering causes a bruise of the skin and deeper tissues, generally accompanied by an abrasion of the surface. It may cause lameness, dangerous tripping, and thickening of the injured parts.

Causes.—Faulty conformation is the most prolific cause of interfering. When the bones of the leg are so united that the toe of the foot turns in, or when the fetlock joints are close together and the toe turns out, when the leg is so deformed that the whole foot and ankle turn either in or out, interfering is almost sure to follow. It may happen, also, when the feet grow too long, from defecting shoeing, rough or slippery roads, from the exhaustion of labor or sickness, swelling of the leg, high knee action, fast work, and because the chest and hips are too narrow.

Symptoms.—Generally, the evidences of interfering are easily detected, for the parts are tender, swollen, and the skin broken. But very often, especially in trotters, the flat surface of the hoof strikes the fetlock without evident injury, and attention is directed to these parts only by the occasional tripping and unsteady gait. In such cases proof of the cause may be had by walking and trotting the animal, after first painting the inside toe and quarter of the suspected foot with a thin coating of chalk, charcoal, mud, or paint.

Treatment.—When the trouble is due to deformity or faulty conformation, it may not be possible to overcome the defect. In such cases, and as well in those due to exhaustion or fatigue, the fetlock, or ankle, boot must be used. In many instances interfering may be prevented by proper shoeing. The outside heel and quarter of the foot on the injured leg should be lowered sufficiently to change the relative position of the fetlock joint, by bringing it farther away from the center plane of the body, thereby permitting the other foot to pass by without striking. A very slight change is often sufficient to effect this result. At the same time the offending foot should be so shod that the shoe may be set well under the hoof at the point responsible for the injury. The shoe should be reset every three or four weeks.

When the cause has been removed, cold-water bandages to the injured parts will soon remove the soreness and swelling, especially in recent cases. If, however, the fetlock has become calloused from long-continued bruising, a Spanish-fly blister over the parts, repeated in two or three weeks if necessary, will aid in reducing the leg to its natural condition.

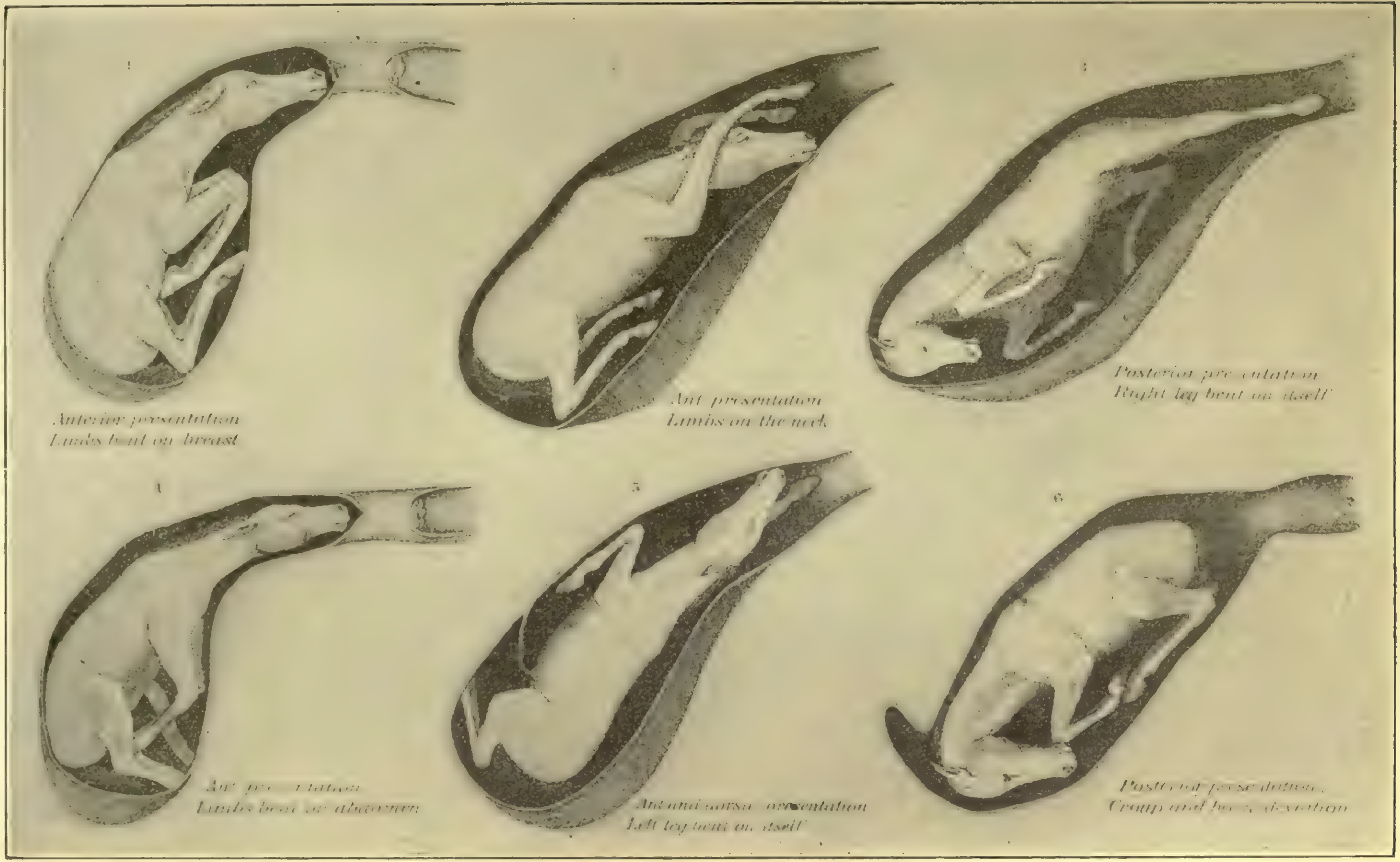
SPRAIN OF THE FETLOCK.

Sprain of the fetlock joint is most common in the fore legs, and, as a rule, affects but one at a time. Horses doing fast work, as trotters, runners, steeplechasers, hunters, cow ponies, and those that interfere, are particularly liable to this injury.

Causes.—Horses knuckling at the fetlock, and all those with diseases which impair the powers of locomotion, such as navicular disease, contracted heels, sidebones, chronic laminitis, etc., are predisposed to sprains of the fetlock. It generally happens from a misstep, stumbling, or slipping, which results in the joint being extended or flexed to excess. The same result may happen where the foot is caught in a rut, hole in a bridge, or in a car track, and the animal falls or struggles violently. Direct blows and punctured wounds may also set up inflammation of the joint.

Symptoms.—The symptoms of sprain of the fetlock vary with the severity of the injury. If slight, there may be no lameness, but simply a little soreness, especially when the foot strikes on uneven ground and the joint is twisted a little. In cases more severe the joint swells, is hot and puffy, and the lameness may be so intense as to compel the animal to hobble on three legs. While at rest the leg is flexed at the joint affected, and the toe rests on the ground.

Treatment.—If the injury is slight, cold-water bandages and a few days' rest are sufficient to effect recovery. Where there is an intense lameness, swelling, etc., the leg should be placed under a constant stream of cold water, as described in the treatment for quit-



1 *Anterior presentation*
Limbs bent on breast

2 *Ant presentation*
Limbs on the neck

3 *Posterior presentation*
Right leg bent on itself

4 *Ant presentation*
Limbs bent on abdomen

5 *Ant and dorsal presentation*
Left leg bent on itself

6 *Posterior presentation*
Croup and hocks flexion

ABNORMAL PRESENTATIONS. HORSE BOOK, B. A. I.

tor. When the inflammation has subsided, a blister to the joint should be applied. In some cases, especially in old horses long accustomed to fast work, the ligaments of the joints are ruptured, in whole or in part, and the lameness may last a long time. In these cases the joint should be kept completely at rest; and this condition is best secured by the application of the plaster of Paris bandages, as in cases of fracture. As a rule, patients take kindly to this bandage, and may be given the freedom of a roomy box or yard while wearing it. If they are disposed to tear it off, or if sufficient rest can not otherwise be secured, the patient must be kept in slings.

In the majority of instances the plaster bandage should remain on from two to four weeks. If the lameness returns when the bandage is removed, a new one should be put on. The swelling, which always remains after the other evidences of the disease have disappeared, mav be largely dissipated and the joint strengthened by the use of the firing iron and blisters. A joint once injured by a severe sprain never entirely regains its original strength, and is ever after particularly liable to a repetition of the injury.

OVERREACH.

An overreach is where the shoe of the hind foot strikes and injures the heel or quarter of the fore foot. It rarely happens except when the animal is going fast, hence is most common in trotting and running horses. In trotters the accident generally happens when the animal breaks from a trot to a run. The outside heels and quarters are most liable to the injury.

Symptoms.—The coronet at the heel or quarter is bruised or cut, the injury in some instances involving the horn as well. Where the hind foot strikes well back on the heel of the fore foot—an accident known among horsemen as grabbing—the shoe may be torn from the fore foot or the animal may fall to its knees. Horses accustomed to overreaching are often bad breakers, for the reason that the pain of the injury so excites them that they can not readily be brought back to the trotting gait.

Treatment.—If the injury is but a slight bruise, cold-water bandages applied for a few days will remove all of the soreness. If the parts are deeply cut, more or less suppuration will follow, and, as a rule, it is well to poultice the parts for a day or two, after which cold baths may be used, or the wounds dressed with tincture of aloes, oakum, and a roller bandage. When an animal is known to be subject to overreaching, he should never be driven fast without quarter boots, which are specially made for the protection of the heels and quarters. If there is a disposition to grab the forward shoes, the trouble may be remedied by having the heels of these shoes made as short as possible, while the toe of the hind foot should project well over the hind shoe. When circumstances will permit of their use, the fore feet may be shod with the tips instead of the common shoe.

CALK WOUNDS.

Horses wearing shoes with sharp calks are liable to wounds of the coronary region, either from trampling on themselves or on each other. These injuries are most common in heavy draft horses, especially on rough roads and slippery streets. The fore feet are more liable than the hind ones, and the seat of injury is commonly on the quarters. In the hind feet the wound often results from the animal resting with the heel of one foot set directly over the front of the other. In these cases the injury is generally close to the horn, and often involves the coronary band, the sensitive laminæ, the extensor tendon, and even the coffin bone.

Treatment.—Preventive measures include the use of boots to protect the coronet of the hind foot, and the use of a blunt calk on the outside heel of the fore shoe, since this is generally the offending instrument where the sore feet are injured. If the wound is not deep, and the soreness slight, cold-water bandages and a light protective dressing, such as carbolized cosmoline, will be all that is needed. Where the injury is deep, followed by inflammation and suppuration of the coronary band, lateral cartilages, sensitive laminæ, etc., active measures must be resorted to. Cold, astringent baths, made by adding 2 ounces of sulphate of iron to 1 gallon of water, should be used, followed by poultices if it is necessary to hasten the cleansing of the wound by stimulating the sloughing process. Where the wound is deep between the horn and skin, especially over the anterior tendon, the horn should be cut away so that the injured tissues may be exposed. The subsequent treatment in these cases should follow the directions laid down in the article on toe cracks.

FROSTBITES.

Excepting the ears, the feet and legs are about the only parts of the horse liable to become frostbitten. The cases most commonly seen are found in cities, especially among car horses, where salt is used for the purpose of melting the snow on curves and switches. This mixture of snow and salt is splashed over the feet and legs, rapidly lowering the temperature of the parts to the freezing point. In mountainous districts, where the snowfall is heavy and the cold often intense, frostbites are not uncommon even among animals running at large.

Treatment.—Simple frostbites are best treated by cold fomentations followed by applications of 5 per cent solution of carbolized oil. When portions of the skin are destroyed, their early separation should be hastened by warm fomentations and poultices. Ulcers are to be treated by the application of stimulating dressings, such as carbolized oil, a 1 per cent solution of nitrate of silver or of chloride of zinc, with pads of oakum and flannel bandages. In many of these cases recovery is exceedingly slow. The new tissue by the destroyed skin is replaced always shrinks in healing, and, as a consequence, unsightly scars are unavoidable. Where the coronary band is involved it is generally advisable to blister the coronet over the seat of injury as soon as the suppuration ceases, for the purpose of stimulating the growth of new horn. Where a crevasse is formed between the old and new horn no serious trouble is likely to be met with until the cleft is nearly grown out, when the soft tissues may be exposed by a breaking off of the partly detached horn. But even where this accident happens final recovery is secured by poulticing the foot until a sufficient growth of horn protects the parts from injury.

QUITTOR.

Quittor is a term applied to various affections of the foot wherein the tissues which are involved undergo a process of degeneration that results in the formation of a slough followed by the elimination of the diseased structures by means of a more or less extensive suppuration. For convenience of consideration quittors may be divided into four classes, as suggested by Girard: (1) Cutaneous quittor, which is known also as simple quittor, skin quittor, and carbuncle of the coronet; (2) tendinous quittor; (3) subhorny quittor; and (4) cartilaginous quittor.

CUTANEOUS QUITTOR.

Simple quittor consists in a local inflammation of the skin and subcutaneous connective tissue on some part of the coronet, followed by a slough and the formation of an ulcer which heals by suppuration.

It is an extremely painful disease, owing to the dense character of the tissues involved; for in all dense structures the swelling which accompanies inflammation always produces intense pressure. This pressure not only adds to the patient's suffering but may at the same time endanger the life of the affected parts by strangulating the blood vessels. It is held by some writers that simple quittor is most often met within the hind feet, but in my experience more than two-thirds of the cases have developed in the fore feet. While any part of the coronet may become the seat of attack, the heels and quarters are undoubtedly most liable.

Causes.—Bruises and other wounds of the coronet are often the cause of cutaneous quittor; yet there can be no question but that in the great majority of cases the disease develops without any known cause. For some reason, not yet satisfactorily explained, most cases happen in the fall of the year. One explanation of this fact has been attempted in the statement that the disease is due to the action of cold and mud. This claim, however, seems to lose force when it is remembered that in many parts of this country the most mud, accompanied by freezing and thawing weather, is seen in the early springtime without a corresponding increase of quittor. Furthermore, the serious outbreaks of this disease in the mountainous regions of Colorado, Wyoming, and Montana are seen in the fall and winter seasons, when the weather is the driest. It may be claimed, and perhaps with justice, that during these seasons, when the water is low, animals are compelled to wade through more mud to drink from lakes and pools than is necessary at other seasons of the year, when these lakes and pools are full. Add to these conditions the further fact that much of this mud is impregnated with alkaline salts, which, like the mineral substances always found in the mud of cities, are more or less irritating, and it seems fair to conclude that under certain circumstances mud may become an important factor in the production of quittor.

While this disease attacks any and all classes of horses, it is the large, common breeds, with thick skins, heavy coats, and coarse legs that are most often affected. Horses well groomed and cared for in stables seem to be less liable to the disease than those running at large or than those which are kept and worked under adverse circumstances.

Symptoms.—Lameness, lasting from one to three or four days, nearly always precedes the development of the strictly local evidences of quittor. The next sign is the appearance of a small, tense, hot, and painful tumor in the skin of the coronary region. If the skin of the affected foot is white, the inflamed portion will present a dark-red or even a purplish appearance near the center. Within a few hours the ankle, or even the whole leg as high as the knee or hock, becomes much swollen. The lameness is now so great that the patient refuses to use the foot at all, but carries it in the air if compelled to move. As a consequence, the opposite leg is required to do the work of both, and if the animal persists in standing a greater part of the time it, too, becomes swollen. In many of these cases the suffering is so intense during the first few days as to cause general fever, dullness, loss of appetite, and increased thirst. Generally the tumor shows signs of suppuration within forty-eight to seventy-two hours after its first appearance; the summit softens, a fluctuating fluid is felt beneath the skin, which soon ulcerates completely through, causing the discharge of a thick, yellow, bloody pus, containing shreds of dead tissue which have sloughed away. The sore is now converted into an open ulcer, generally deep, nearly or quite circular in outline, and with hardened base and edges. In exceptional cases large patches of skin, varying from 1 to 2½ inches in diameter, slough away at once, leaving an ugly superficial ulcer. These sores, especially when deep, suppurate freely, and if there are no complications they tend to heal rapidly as soon as the degenerated tissue has softened and is entirely removed. When suppuration is fully established, the lameness and general symptoms subside. Where but a single tumor and abscess form, the disease progresses rapidly, and recovery, under proper treatment, may be affected in from two to three weeks; but when two or more tumors are developed at once, or where the formation of one tumor is rapidly succeeded by another for an indefinite time, the sufferings of the patient are greatly increased, the case is more difficult to treat, and recovery is more slow and less certain. This form of quittor is often complicated with the tendinous and subhorny quittors by an extension of the sloughing process.

Treatment.—The first step in the treatment of an outbreak of quittor should be the removal of all exciting causes. Crowding animals into small corrals and stables, where injuries to the coronet are likely to happen from trampling, especially among unbroken range horses, must be avoided as much as possible. Watering places accessible without having to wade through mud are to be supplied. In towns, where the mud or dust is largely impregnated with mineral products, it is not possible to adopt complete preventive measures. Much can be done, however, by careful cleansing of the feet and legs as soon as the animal returns from work. Warm water should be used to remove the mud and dirt, after which the parts are to be thoroughly dried with soft cloths.

The means which are to be adopted for the cure of cutaneous quittor vary with the stage of the disease at the time the case is presented for treatment. If the case is seen early—that is, before any of the signs of suppuration have developed—the affected foot is to be placed under a constant stream of cold water, with the object of arresting a further extension of the inflammatory process. To accomplish this, put the patient in slings in a narrow stall having a slat or open floor. Bandage the foot and leg to the knee or hock, as the case may be, with flannel bandages loosely applied. Set a tub or barrel filled with cold water above the patient, and by the use of a small rubber hose of sufficient length make a siphon which will carry the water from the bottom of the tub to the leg at the top of the bandages. The stream of water should be quite small, and is to be continued until the inflammation has entirely subsided or until the presence of pus can be detected in the tumor. When suppuration has commenced, the process should be aided by the use of warm baths and poultices of linseed meal or boiled turnips. If the tumor is of rapid growth, accompanied by intense pain, relief is secured and sloughing largely limited by a free incision of the parts. The incision should be vertical and deep into the tumor, care being taken not to entirely divide the coronary band. If the tumor is large, more than one incision may be necessary.

The foot should now be placed in a warm bath for half an hour or longer and then poulticed. The hemorrhage produced by the cutting and encouraged by the warm bath is generally very copious and soon gives relief to the overtension of the parts. In other cases it will be found that suppuration is well under way, so that the center of the tumor is soft when the patient is first presented for treatment. It is always good surgery to relieve the tumor of pus whenever its presence can be detected; hence in these cases a free incision must be made into the softened parts, the pus evacuated, and the foot poulticed.

By surgical interference the tumor is now converted into an open sore or ulcer, which, after it has been well cleaned by warm baths and poultices applied for two or three days, needs to be protected by proper dressings. The best of all protective dressings is made of small balls, or pledgets, of oakum, carefully packed into the wound and held in place by a roller bandage 4 yards long, from 3 to 4 inches wide, made of common bedticking and skillfully applied. The remedies which may be used to stimulate the healing process are many, and, as a rule, they are applied in the form of solutions or tinctures.

Remedies which may be used with good results are sulphate of copper, iron, and zinc, 5 grains of either to the ounce of water; chloride of zinc, 5 grains to the ounce; carbolic acid, 20 drops dissolved in an equal amount of glycerin and added to 1 ounce of water; nitrate of silver, 10 grains to the ounce of water; and creolin, pure or diluted. If the wound is slow to heal, it will be found of advantage to change the remedies every few days. If the wound is pale in color, the granulations transparent and glistening, the tincture of aloes, tincture of gentian, or the spirits of camphor may do best. When the sore is red in color and healing rapidly, an ointment made of one part of carbolic acid to 40 parts of cosmoline or vaseline is all that is needed. If the granulations continue to grow until a tumor is formed which projects beyond the surrounding skin, it should be cut off with a sharp, clean knife, and the foot poulticed for twenty-four hours, after which the wound is to be well cauterized daily with lunar caustic and the bandages applied with great firmness.

The question as to how often the dressing should be renewed must be determined by the condition of the wound, etc. If the sore is suppurating freely it will be necessary to renew the dressing every twenty-four or forty-eight hours; if the discharge is small in quantity and the patient comfortable, the dressing may be left on for several days; in fact, the less often the wound is disturbed the better, in so long as the healing process is healthy. When the sore commences to skin over, the edges should be lightly touched with lunar caustic at each dressing. The patient may now be given a little exercise daily; but the bandages must be kept on until the wound is entirely healed.

TENDINOUS QUITTOR.

This form of quittor differs from the cutaneous in that it not only affects the skin and subcutaneous tissues, but involves, also, the tendons of the leg, the ligaments of the joints, and, in many cases, the bones of the foot as well.

Fortunately this form of quittor is less common than the preceding; yet any case beginning as simple cutaneous quittor may at any time during its course become complicated by the death of some part of the tendons, by gangrene of the ligaments, sloughing of the coronary band, caries of the bones, or inflammation and suppuration of the synovial sacs and joints, thereby converting a simple quittor into one which will, in all probability, either destroy the patients' life or maim him for all time. Tendinous quittor is caused by the same injuries and influences that produce the simple form.

Symptoms.—When a case of simple quittor is transformed into the tendinous variety the change is announced by a sudden increase in the severity of all the symptoms. On the other hand, if the attack primarily is one of tendinous quittor, the earliest symptom seen is a well-marked lameness. In those cases due to causes other than injuries this lameness is at first very slight, and the animal limps no more in trotting than in walking; but later on, generally during the next forty-eight hours, the lameness increases to such an extent that the patient often refuses to use the leg at all. An examination made during the first two days rarely discloses any cause for this lameness; it may not be possible even to say with certainty that the foot is the seat of the trouble. On the third or fourth day, sometimes as late as the fifth, a doughy-feeling tumor will be found forming on the heel or quarter. This tumor grows rapidly, feels hot to the touch, and is extremely painful. As the tumor develops, all the other symptoms increase in intensity; the pulse is rapid and hard; the breathing quick; the temperature elevated three or four degrees; the appetite is gone; thirst increased, and the lameness so great that the foot is carried in the air if locomotion is attempted. At this stage of the disease the patient generally seeks relief by lying upon the broad side, with outstretched legs; the coat is bedewed with a clammy sweat, and every respiration is accompanied by a moan. The leg soon swells to the fetlock; later this swelling gradually extends to the knee or hock, and in some cases reaches the body. As a rule, several days elapse before the disease develops a well-defined abscess, for, owing to the dense structure of the bones, ligaments, and tendons, the suppurative process is a slow one, and the pus is prevented from readily collecting in a mass.

Treatment.—The treatment of tendinous quittor is to be directed toward the saving of the foot. First of all an effort must be made to prevent suppuration; and if the patient is seen at the beginning, cold irrigation, recommended in the treatment for cutaneous quittor, is to be resorted to. Later on, when the tumor is forming on the coronet, the knife must be used, and a free and deep incision made into the swelling. Whenever openings appear from which pus escapes, they should be carefully probed; in all instances these fistulous tracts lead down to dead tissue which nature is trying to remove by the process of sloughing. If a counter opening can be made, which will enable a more ready escape of the pus, it should be done at once; for instance, if the probe shows that the discharge originates from the bottom of the foot, the sole must be pared through over the seat of trouble. Whenever suppuration has commenced the process is to be stimulated by the use of warm baths and poultices. The pus which accumulates in the deeper parts, especially along the tendons, around the joints, and in the hoof, is to be removed by pressure and injections made with a small syringe, repeated two or three times a day. As soon as the discharge assumes a healthy character and diminishes in quantity, stimulating solutions are to be injected into the open wounds. Where the tendons, ligaments, and other deeper parts are affected, a strong solution of carbolic acid—1 to 4—should be used at first. Or strong solutions of tincture of iodine, sulphate of iron, sulphate of copper, bichloride of mercury, etc., may be used in place of the carbolic; after which the remedies and dressings directed for use in simple quittor are to be used. In those cases where the fistulous tracts refuse to heal it is often necessary to burn them out with a saturated solution of caustic soda, equal parts of muriatic acid and water; or, better still, with a long, thin iron, heated white hot.

But no matter what treatment is adopted, a large percentage of the cases of tendinous quittor fail to make good recoveries. Where the entire hoof sloughs away, the growth of a new, but soft and imperfect, hoof may be secured by carefully protecting the exposed tissues with proper bandages. When the joints are opened by deep sloughing, recovery may eventually take place, but the joint remains immovable ever after. If caries of a small part of the coffin bone takes place, it may be removed by an operation; but if much of the bone is affected, or if the navicular and coronet bones are involved in the carious process, the only hope for a cure is in the amputation of the foot. This operation is advisable only where the animal is valuable for breeding purposes. In all other cases where there is no hope for recovery the patient's suffering should be relieved by death. In tendinous quittor much thickening of the coronary region, and sometimes of the ankle and fetlock, remains after suppuration has ceased and the fistulous tracts have healed. To stimulate the reabsorption of this new and unnecessary tissue, the parts should be fired with the hot iron, or, in its absence, repeated blistering with the biniodide of mercury ointment may largely accomplish the same result.

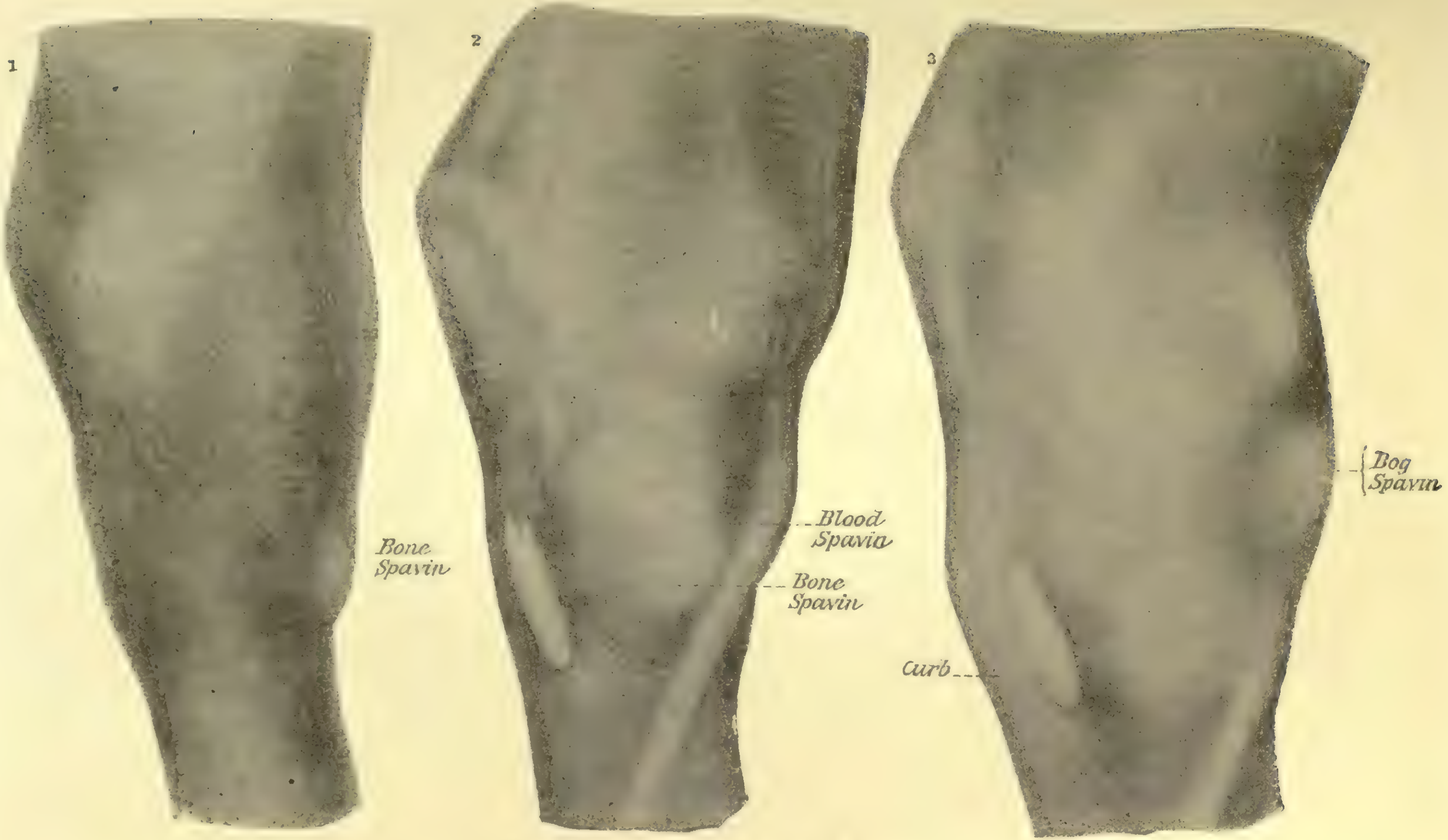
SUBHORNY QUITTOR.

This is the most common form of the disease. It is generally seen in but one foot at a time, and more often in the fore than in the hind feet. It nearly always attacks the inside quarter, but may affect the outside quarter, the band in front, or the heel, where it is of but little consequence. It consists in the inflammation of a small part of the coronary band and adjacent skin, followed by sloughing and suppuration, which in most cases extends to the neighboring sensitive laminæ.

Causes.—Injuries to the coronet, such as bruises, overreaching, and calk wounds, are considered as the common causes of this disease. Still cases occur in which there appears to be no existing cause, just as in the other forms of quittor, and it seems fair to conclude that subhorny quittor may also be produced by internal causes.

Symptoms.—At the outset the lameness is always severe, and the patient often refuses to use the affected foot. Swelling of the coronet close to the top of the hoof causes the quarter to protrude beyond the wall. This tumor is extremely sensitive, and the whole foot is hot and painful. After a few days a small spot in the skin, over the most elevated part of the tumor, softens and opens or the hoof separates from the coronary band at the quarter or well back towards the heel. From this opening, wherever it may be, a thin, watery, offensive discharge escapes, often dark in color, at times mixed with blood, and always containing a considerable percentage of pus. Probing will now disclose a fistulous tract leading to the bottom of the diseased tissues. If the opening is small, there is a tendency upon the part of the suppurative process to spread downward; the pus gradually separates the hoof from the sensitive laminæ until the sole is reached, and even a portion of this may be undermined.

As a rule, the slough in this form of quittor is not deep, and if the case receives early and proper treatment complications are generally avoided; but if the case is neglected, and, occasionally, even in spite of the best of treatment, the disease spreads until the ten-



Various Types of Spavin. B. A. I. 1902.

don in front, the lateral cartilage, or the coffin bone and joints as well are involved. In all cases of subhorny quittor much relief is experienced when the slough comes away, and rapid recovery is made. If, however, after the lapse of a few days, the lameness remains and the wound continues to discharge a thin unhealthy matter, the probabilities are that the disease is spreading, and pus collecting in the deeper parts of the foot.

Treatment.—Hot baths and poultices are to be used until the presence of pus can be determined, when the tumor is to be opened with a knife or sharp-pointed iron heated white hot. The hot baths and poultices are now continued for a few days or until the entire slough has come away and the discharge is diminished, when dressings recommended in the treatment for cutaneous quittor are to be used until recovery is completed. In cases where the discharge comes from a cleft between the upper border of the hoof and the coronary band, always pare away the loosened horn, so that the soft tissues beneath are fully exposed, care being taken not to injure the healthy parts. This operation permits of a thorough inspection of the diseased parts, the easy removal of all gangrenous tissue, and a better application of the necessary remedies and dressings. The only objection to the operation is that the patient is prevented from being early returned to work.

When the probe shows that pus has collected under the coffin bone the sole must be pared through, and if caries of the bone is present the dead parts cut away. After either of these operations the wound is to be dressed with the oakum balls, saturated in the bichloride of mercury solution, as previously directed, and the bandages tightly applied. Generally the discharge for the first two or three days is so great that the dressings need to be changed every twenty-four hours; but when the discharge diminishes, the dressing may be left on from one to two weeks. Before the patient is returned to work, a bar shoe should be applied, since the removed quarter or heel can only be made perfect again by a new growth from the coronary band. Tendinous or cartilaginous complications are to be treated as directed under those headings.

CARTILAGINOUS QUITTOR.

This form of quittor may commence as a primary inflammation of the lateral cartilage, but in the great majority of cases it appears as a sequel to cutaneous or subhorny quittor. It may affect either the fore or hind feet, but is most commonly seen in the former. As a rule, it attacks but one foot at a time, and but one of the cartilages, generally the inner one. It is always a serious affection for the reason that, in many cases, it can only be cured by a surgical operation, requiring a thorough knowledge of the anatomy of the parts involved and much surgical skill.

Causes.—Direct injuries to the coronet, such as trampling, pricks, burns, and the blow of some heavy falling object which may puncture, bruise, or crush the cartilage, are the common direct causes of cartilaginous quittor. Besides being a sequel to the other forms of quittor, it sometimes develops as a complication in suppurative corn, canker, grease, laminitis, and punctured wounds of the foot. Animals used for heavy draft, and those with flat feet and low heels, are more liable to the disease than others, for the simple reason that they are more exposed to injury. Rough roads also predispose to the disease by increasing liability to injury.

Symptoms.—When the disease commences as a primary inflammation of the cartilage, lameness develops with the formation of a swelling on the side of the coronet over the quarter. The severity of this lameness depends largely upon the part of the cartilage which is diseased, for if the disease is situated in that part of the cartilage nearest to the heel, where the surrounding tissues are soft and spongy, the lameness may be very slight, especially if the patient is required to go no faster than a walk; but when the middle and anterior parts of the cartilage are diseased, the pain and consequent lameness are much greater, for the tissues are less elastic and the coffin joint is more likely to become affected.

Except in the cases to be noted hereafter, one or more fistulous openings finally appear in the tumor on the coronet. These openings are surrounded by a small mass of granulations which are elevated above the adjacent skin and bleed readily if handled. A probe shows these fistulous tracts to be more or less sinuous, but always leading to one point—the gangrenous cartilage. When cartilaginous quittor happens as a complication of suppurative corn, or from punctured wounds of the foot, the fistulous tract may open alone at the point of injury on the sole.

The discharge in this form of quittor is generally thin, watery, and contains enough pus to give it a pale yellow color; it is offensive to the sense of smell, due to the detachment of small flakes of cartilage which have become gangrenous and are seen in the discharge as small greenish colored particles. In old cases it is not unusual to find some of the fistulous openings heal at the surface; this is followed by the gradual collection of pus in the deeper parts, forming an abscess, which in a short time opens at a new point. The wall of the hoof, over the affected quarter and heel, in very old cases becomes rough and wrinkled like the horn of a ram, and generally it is thicker than the corresponding quarter, owing to the stimulating effect which the disease has upon the coronary band. Complications may arise by an extension of the disease to the lateral ligament of the coffin joint, to the joint itself, to the plantar cushion, and by caries of the coffin bone.

Treatment.—Before recovery can take place all of the dead cartilage must be removed. In rare instances this is effected by nature without assistance. Usually, however, the disease does not tend to recovery, and active curative measures must be adopted. The best and simplest treatment, in a majority of cases, is the injection of strong caustic solutions, which destroy the diseased cartilage and cause its discharge, along with the other products of suppuration. In favorable cases these injections will secure a healing of the wound in from two to three weeks. While the saturated solution of sulphate of copper, or a solution of 10 parts of bichloride of mercury to 100 parts of water, has given the best results in my hands, equally as favorable success has been secured by others from the use of caustic soda, nitrate of silver, sulphate of zinc, tincture of iodine, etc. But no matter which one of these remedies may be selected, it must be used at least twice a day for a time. The solution is injected into the various openings with enough force to drive it to the bottom of the wound, after which the foot is to be dressed with a pad of oakum, held in place by a roller bandage tightly applied. While it is not always necessary, it is often of advantage to relieve the pressure on the parts by rasping away the hoof over the seat of the cartilage; the coronary band and laminæ should not be injured in the operation.

If the caustic injections prove successful, the discharge will become healthy and gradually diminish, so that by the end of the second week the fistulous tracts are closing up, and the injections are made with much difficulty. If, on the other hand, there is but little or no improvement after this treatment has been used for three weeks, it may reasonably be concluded that the operation for the removal of the lateral cartilage must be resorted to for the cure of the trouble. As this operation can be safely undertaken only by an expert surgeon, it will not be described in this connection.

THRUSH.

Thrush is characterized by an excessive secretion of unhealthy matter from the cleft of the frog. While all classes of horses are liable to this affection, it is more often seen in the common draft horse than in any other breed—a fact due to the conditions of servitude and not to the fault of the breed. Country horses are much less subject to the disease, except in wet, marshy districts, than are the horses used in cities and towns.

Causes.—The most common cause of thrush is the filthy condition of the stable in which the animal is kept. Mares are more liable to contract the disease in the hind feet when the cause is due to filth, while the gelding and stallion are more likely to develop it in the fore feet. Hard work on rough and stony roads may also induce the disease, as may a change from dryness to excessive moisture. The latter cause is often seen to operate in old track horses, whose feet are constantly soaked in the bath tub for the purpose of relieving soreness. Muddy streets and roads, especially where mineral substances are plentiful, excite this abnormal condition of the frog. Contracted heels, scratches, and navicular disease predispose to thrush, while by some a constitutional tendency is believed to exist among certain animals which otherwise present a perfect frog.

Symptoms.—At first there is simply an increased moisture in the cleft of the frog, accompanied by an offensive smell. After a time a considerable discharge takes place—thin, watery, and highly offensive, changing gradually to a thicker puriform matter, which rapidly destroys the horn of the frog. Only in old and severe cases is the patient lame and the foot feverish—cases in which the whole frog is involved in the diseased process.

Treatment.—Thrushes are to be treated by cleanliness, the removal of all exciting causes, and a return of the frog to its normal condition. As a rule, the diseased and ragged portions of horn are to be pared away and the foot poulticed for a day or two with boiled turnips, to which may be added a few drops of carbolic acid or a handful of powdered charcoal to destroy the offensive smell. The cleft of the frog and the grooves on its edges are then to be cleaned and well filled with dry calomel and the foot dressed with oakum and a roller bandage. If the discharge is profuse, the dressing should be changed daily; otherwise it may be left on two or three days. Where a constitutional taint is supposed to exist, with swelling of the legs, grease, etc., a purgative, followed by dram doses of sulphate of iron, repeated daily, may be prescribed. In cases where the growth of horn seems too slow a Spanish-fly blister applied to the heels is often followed by good results. Feet in which the disease is readily induced may be protected in the stable with a leather boot. If the thrush is but a sequel to other diseases, a permanent cure may not be possible.

CANKER.

Canker of the foot is due to the rapid reproduction of a vegetable parasite. It not only destroys the sole and frog, but, by setting up a chronic inflammation in the deeper tissues, prevents the growth of a healthy horn by which the injury might be repaired. Heavy cart horses are more often affected than those of any other class.

Causes.—The essential element in the production of canker is the parasite; consequently the disease may be called contagious. But, as in all other diseases due to specific causes, the seeds of the disorder must find a suitable soil in which to grow before they are reproduced. It may be said, then, that the conditions which favor the preparation of the tissues for a reception of the seeds of this disease are simply predisposing causes.

The condition most favorable to the development of canker is dampness—in fact, dampness seems indispensable to the existence and growth of the parasite; for the disease is rarely, if ever, seen in high, dry districts, and is much more common in rainy than in dry seasons. Filthy stables and muddy roads have been classed among the causes of canker; but it is very doubtful if these conditions can do more than favor a preparation of the foot for the reception of the disease germ.

All injuries to the feet may, by exposing the soft tissues, render the animal susceptible to infection; but neither the injury nor the irritation and inflammation of the tissues which follow are sufficient to induce the disease. For some unknown reason horses with lymphatic temperaments—thick skins, flat feet, fleshy frogs, heavy hair, and particularly with white feet and legs—are especially liable to canker.

Symptoms.—Usually, canker is confined to one foot; but it may attack two, three, or all of the feet at once; or, as is more commonly seen, the disease attacks first one then another, until all may have been successively affected. When the disease follows an injury which has exposed the soft tissues of the foot, the wound shows no tendency to heal, but instead there is secreted from the inflamed parts a profuse, thin, fetid, watery discharge, which gradually undermines and destroys the surrounding horn, until a large part of the sole and frog is diseased. The living tissues are swollen, dark colored, and covered at certain points with particles of new, soft, yellowish, thready horn, which are constantly undergoing maceration in the abundant liquid secretion by which they are immersed. As this secretion escapes to the surrounding parts, it dries and forms small, cheesy masses composed of partly dried horny matter, exceedingly offensive to the sense of smell. When the disease originates independently of an injury, the first evidences of the trouble are the offensive odor of the foot, the liquid secretion from the cleft and sides of the frog, and the rotting away of the horn of the frog and sole.

In the earlier stages there is no interference with locomotion, but later the foot becomes sensitive, particularly if the animal is used on rough roads, and, finally, when the sole and frog are largely destroyed the lameness is severe.

Treatment.—Since canker does not destroy the power of the tissues to produce horn, but rather excites them to an excessive production of an imperfect horn, the indications for treatment are to restore the parts to a normal condition, when healthy horn may again be secreted. The old practice of stripping off the entire sole and deep cauterization, with either the hot iron or strong acids, is not attended with uniformly good results.

It is believed that recovery can generally be effected as surely and as speedily with measures which are less heroic and much less painful. True, the treatment of canker is likely to exhaust the patience, and sometimes the resources, of the attendant; but after all success depends more on the persistent application of simple remedies and great cleanliness than on the special virtues of any particular drug.

First, then, clean the foot with warm baths and apply a poultice containing powdered charcoal or carbolic acid. A handful of the charcoal or a tablespoonful of the acid mixed with the poultice serves to destroy much of the offensive odor. The diseased portions of horn are to be carefully removed with sharp instruments, until only healthy horn borders the affected parts. The edges of the sound horn are to be pared thin, so that the swollen soft tissues may not overlap their borders. With sharp scissors cut off all the prominent points on the soft tissues, shorten the walls of the foot, and nail on a broad, plain shoe. The foot is now ready for the dressings, and any of the many stimulating and drying remedies may be used; but it will be necessary to change frequently from one to another, until finally all may be tried.

The list from which a selection may be made comprises wood tar, gas tar, petroleum, creosote, phenic acid; sulphates of iron, copper, and zinc; chloride of zinc, bichloride of mercury, calomel, caustic soda, nitrate of silver, chloride of lime; carbolic, nitric, and sulphuric acids.

In practice it is preferred to give the newly shod foot a bath for an hour or two in a solution of the sulphate of iron, made by adding 2 ounces of the powdered sulphate to a gallon of cold water. When the foot is removed it is dressed with oakum balls dipped in a mixture made of Barbados tar 1 part, oil of turpentine 8 parts, to which is slowly added 2 parts of sulphuric acid, and the mixture well stirred and cooled. The diseased parts being well covered with the balls, a pad of oakum, sufficiently thick to cause considerable pressure, is placed over them, and all are held in place by pieces of heavy tin fitted to slip under the shoe. The whole foot is now incased in a boot or folded gunny sack, and the patient turned into a loose, dry box. The dressings are to be changed daily or even twice a day, at first. When they are removed, all pieces of new horny matter which are now firmly adherent must be rubbed off with the finger or a tent of oakum. As the secretion diminishes, dry powders may prove of most advantage, such as calomel, sulphates of iron, copper, etc. The sulphates should not be used pure, but are to be mixed with powdered animal charcoal in the proportion of one of the former to eight or ten parts of the latter. When the soft tissues are all horned over, the dressings should be continued for a time, weak solutions being used to prevent a recurrence of the disease. If the patient is run down in condition, bitter tonics, such as gentian, may be given in 2-dram doses, twice a day, and a liberal diet of grain allowed.

CORNS.

A corn is an injury to the living horn of the foot, involving the soft tissues beneath, whereby the capillary blood vessels are ruptured and a small amount of blood escapes, which, by permeating the horn in the immediate neighborhood, stains it a dark color. If the injury is continuously repeated, the horn becomes altered in character, and the soft tissues may suppurate or a horny tumor develop. Corns always appear in the sole in the angle between the bar and the outside wall of the hoof. In many cases the laminæ of the bar, of the wall, or of both are involved at the same time.

Three kinds of corns are commonly recognized—the dry, the moist, and the suppurative—a division based solely on the character of the conditions which follow the primary injury. The fore feet are almost exclusively the subjects of the disease, for two reasons: First, because they support a greater part of the body; secondly, because the heel of the fore foot during progression is first placed upon the ground, whereby it receives much more concussion than the heel of the hind foot, in which the toe first strikes the ground.

Treatment.—As in all other troubles, the cause must be discovered, if possible, and removed. In the great majority of cases the shoeing will be at fault. While sudden changes in the method of shoeing are not advisable, it may be said that all errors, either in the preparation of the foot, in the construction of the shoe, or in its application may very properly be corrected at any time. Circumstances may at times make it imperative that shoes shall be worn which are not free from objections; as, for instance, the shoe with a high calk; but in such cases it is considered that the injuries liable to result from the use of calks are less serious than those which are sure to happen for the want of them.

For a sound foot perfectly formed, a flat shoe, with heels less thick than the toe, and which rests evenly on the wall proper, is the best. In flat feet it is often necessary to concave the shoe as much as possible on the upper surface, so that the sole may not be pressed upon. If the heels are very low the heels of the shoe may be made thicker. If the foot is very broad and the wall light toward the heels, a bar shoe resting upon the frog will aid to prevent excessive tension upon the soft tissues when the foot receives the weight of the body. A piece of leather placed between the foot and shoe serves largely to destroy concussion, and its use is absolutely necessary on some animals to enable them to work.

Last among the preventive measures may be mentioned those which serve to maintain the suppleness of the hoof. The dead horn upon the surface of the sole not only retains moisture for a long time, but protects the living horn beneath from the effects of evaporation; for this reason the sole should be pared as little as possible. Stuffing the feet with flaxseed meal, wet clay, or other like substances, or damp dirt floors or damp bedding of tanbark, greasy hoof ointments, etc., are all means which may be used to keep the feet from becoming too dry and hard.

As to the curative measures which are to be adopted much will depend upon the extent of the injury. If the case is one of chronic dry corn, with but slight lameness, the foot should be poulticed for a day or two and the discolored horn pared out, care being taken not to injure the soft tissues. The heel on the affected side is to be lowered until all pressure is removed and, if the patient's labor is required, the foot must be shod with a bar shoe or with one having stiff heels. Care must be taken to reset the shoe before the foot has grown too long, else the shoe will no longer rest on the wall, but on the sole and bar.

Moist corns may be cut out. If there is inflammation present, cold baths and poultices should be used; when the horn is well softened and the fever allayed, pare out all of the diseased horn, lightly cauterize the soft tissues beneath and poultice the foot for two or three days. When the granulations look red, dress the wound with oakum balls saturated in a weak solution of tincture of aloes or spirits of camphor and apply a roller bandage. Change the dressing every two or three days until a firm, healthy layer of new horn covers the wound, when the shoe may be put on, as in dry corn, and the patient returned to work.

In suppurative corns the loosened horn must be removed, so that the pus may freely escape. If the pus has worked a passage to the coronary band and escapes from an opening between the band and hoof, an opening must be made on the sole, and cold baths made astringent with a little sulphate of iron or copper are to be used for a day or two. When the discharge becomes healthy, the fistulous tracts may be injected daily with a weak solution of bichloride of mercury, nitrate of silver, etc., and the foot dressed as after operation for moist corns. When complications arise, the treatment must be varied to meet the indications; if gangrene of the lateral cartilage takes place it must be treated as directed under the head of cartilaginous quittor; if the velvety tissue is gangrenous, it must be cut away; if the coffin bone is necrosed, it must be scraped, and the resulting wounds treated on general principles. After any of the operations for corns have been performed, in which the soft tissues have been laid bare, it is best to protect the foot by a sole of soft leather set beneath the shoe when the animal is returned to work. Only in rare instances are the complications of corns so serious as to destroy the life or usefulness of the patient. It is the wide, flat foot with low heels and thin wall which is most liable to resist all efforts toward affecting a complete cure.

BRUISE OF THE FROG.

When the frog is severely bruised, the injury is followed by suppuration beneath the horn, and at times by partial gangrene of the plantar cushion. A bruise of the frog generally happens from stepping on a rough stone or other hard object. It is more apt to take place when trotting, running, or jumping than when at a slower pace. A stone wedged in the shoe and pressing on the frog or between the sides of the frog and the shoe, if it remains for a time, produces the same results. A cut through the horny frog with some sharp instrument or a punctured wound by a blunt pointed instrument may also cause suppuration and gangrene of the plantar cushion. Broad, flat feet with low heels and a fleshy frog are most liable to these injuries.

Symptoms.—Lameness, severe in proportion to the extent of the bruise and the consequent suppuration, is always an early symptom. When the animal moves, the toe only is placed to the ground or the foot is carried in the air and the patient hobbles along on three legs. When he is at rest, the foot is set forward with the toe on the ground and the leg flexed at the fetlock joint. As soon as the pus finds its way to the surface the lameness improves. If the frog is examined early the injured spot may usually be found; later, if no opening exists, the pus may be discovered working its way toward the heels. The horn is loosened from the deeper tissues, and, if pared through, a thin, yellow, watery and offensive pus escapes. In other cases a ragged opening is found in the frog, leading down to a mass of dead, sloughing tissues, which are pale green in color if gangrene of the plantar cushion has set in. In rare cases the coffin bone may be involved in the injury and a small portion of it become carious.

Treatment.—If the injury is seen at once, the foot should be placed in a bath of cold water to prevent suppuration. If suppuration has already set in, the horn of the frog, and of the bars and branches of the sole, if necessary, is to be pared thin so that all possible pressure may be removed, and the foot poulticed. When the pus has loosened the horn, all the detached portions are to be cut away. If the pus is discharging from an opening near the hair, the whole frog, or one-half of it, will generally be found separated from the plantar cushion, and is to be removed with the knife. After a few days the gangrenous portion of the cushion will slough off from the effects of the poultice; under rare circumstances only should the dead parts be removed by surgical interference. When the slough is all detached, the remaining wound is to be treated with simple stimulating dressings, such as tincture of aloes or turpentine, oakum balls, and bandages as directed in punctured wounds. When the lameness has subsided, and a thin layer of new horn has covered the exposed parts, the foot may be shod. Cover the frog with a thick pad of oakum, held in place by pieces of tin fitted to slide under the shoe, and return to slow work. Where caries of the coffin bone, etc., follow the injury, the treatment recommended for these complications in punctured wounds of the foot must be resorted to.

CONTRACTED HEELS, OR HOOF-BOUND.

Contracted heels, or hoof-bound, is a common disease among horses kept on hard floors in dry stables, and in such as are subject to much saddle work. It consists in an atrophy, or shrinking, of the tissues of the foot, whereby the lateral diameter of the heels is diminished. It affects the fore feet principally; but it is seen occasionally in the hind feet, where it is of less importance for the reason that the hind foot first strikes the ground with the toe, and, consequently, less expansion of the heels is necessary than in the fore feet, where the weight is first received on the heels. Any interference with the expansibility of this part of the foot interferes with locomotion and ultimately gives rise to lameness. Usually but one foot is affected at a time; but when both are diseased the change is greater in one than in the other. Occasionally but one heel, and that the inner one, is contracted; in these cases there is less likely to be lameness and permanent impairment of the animal's usefulness. According to the opinion of some of the French veterinarians, hoof-bound should be divided into two classes—total contraction, where the whole foot is shrunken in size; and contraction of the heels, when the trouble extends only from the quarters backward.

Causes.—Animals raised in wet or marshy districts, when taken to towns and kept on dry floors, are liable to have contracted heels, not alone because the horn becomes dry, but because fever of the feet and wasting away of the soft tissues result from the change. Another common cause of contracted heels is to be found in faulty shoeing, such as rasping the wall, cutting away the frog, heels, and bars; high calks and the use of nails too near the heels. Contracted heels may happen as one of the results of other diseases of the foot; for instance, it often accompanies thrush, sidebones, ringbones, canker, navicular disease, corns, sprains of the flexor tendons, of the sesamoid and suspensory ligaments, and from excessive knuckling of the fetlock joints.

Symptoms.—In contraction of the heels the foot has lost its circular shape, and the walls from the quarters backward approach to a straight line. The ground surface of the foot is now smaller than the coronary circumference; the frog is pinched between the inclosing heels, is much shrunken, and at times is affected with thrush. The sole is more concave than natural, the heels are higher, and the bars are long and nearly perpendicular. The whole hoof is dry, and so hard that it can scarcely be cut; the parts toward the heels are scaly and often ridged like the horns of a ram, while fissures, more or less deep, may be seen at the quarters and heels following the direction of the horn fibers. When the disease is well advanced, lameness is present, while in the earlier stages there is only an uneasiness evinced by frequent shifting of the affected foot. Stumbling is common, especially on hard or rough roads. In most cases the animal comes out of the stable stiff and inclined to walk on the toe, but after exercise he may go free again. He wears his shoes off at the toe in a short time, no matter whether he works or remains in the stable. If the shoe is removed and the foot pared in old cases, a dry, mealy horn will be found where the sole and wall unite, extending upward in a narrow line toward the quarters.

Treatment.—First of all, the preventive measures must be considered. The feet are to be kept moist and the horn from drying out by the use of damp sawdust or other bedding; by occasional poultices of boiled turnips, linseed meal, etc., and greasy hoof ointments to the sole and walls of the feet. The wall of the foot should be spared from the abuse of the rasp; the frog, heels, and bars are not to be mutilated with the knife, nor should calks be used on the shoe except when absolutely necessary. The shoes should be reset at least once a month, to prevent the feet from becoming too long, and daily exercise must be insisted on.

As to the curative measures, a diversity of opinion exists. A number of kinds of special shoes have been invented, having for an object the spreading of the heels, and perhaps any of these, if properly used, would eventually effect the desired result. But a serious objection to most of these shoes is that they are expensive and often difficult to make and apply. An inexpensive method of treatment consists, first, in the use of poultices or baths of cold water until the horn is thoroughly softened. The foot is now prepared for the shoe in the usual way, except that the heels are lowered a little, and the frog remains untouched. A shoe, called a tip, is made by cutting off both branches at the center of the foot and drawing the ends down to an edge. The tapering of the branches should begin at the toe, and the shoe should be of the usual width, with both the upper and lower surfaces flat. This tip is to be fastened on with six or eight small nails, all set well forward, two being in the toe. With a common foot rasp begin at the heels, close to the coronet, and cut away the horn of the wall until only a thin layer covers the soft tissues beneath. Cut forward until the new surface meets the old 2½ or 3 inches from the heel. The same sloping shape is to be observed in cutting downward toward the bottom of the foot, at which point the wall is to retain its normal thickness. The foot is now blistered all around the coronet with Spanish-fly ointment; when this is well set, the patient is to be turned to pasture in a damp field or meadow. The blister should be repeated in three or four weeks, and, as a rule, the patient can be returned to work in two or three months' time.

The object of the tip is to throw the weight on the frog and heels, which are readily spread after the horn has been cut away on the sides of the wall. The internal structures of the foot at the heels, being relieved of excessive pressure, regain their normal condition if the disease is not of too long standing. The blister tends to relieve any inflammation which may be present, and stimulates a rapid growth of healthy horn, which, in most cases, ultimately forms a wide and normal heel. In old, chronic cases, with a shrunken frog and increased concavity of the sole, accompanied by excessive wasting of all the internal tissues of the foot, satisfactory results can not be expected and are rarely secured. Still, much relief, if not an entire cure, may be effected by these measures.

SAND-CRACKS.

A sand-crack is a fissure in the horn of the wall of the foot. These fissures are quite narrow, and, as a general rule, they follow the direction of the horny fibers. They may occur on any part of the wall, but ordinarily are only seen directly in front, when they are called toe-cracks; or on the lateral parts of the walls, when they are known as quarter-cracks.

Toe-cracks are most common in the hind feet, while quarter-cracks nearly always affect the fore feet. The inside quarter is more liable to the injury than the outside, for the reason that this quarter is not only the thinner, but during locomotion receives a greater part of the weight of the body. A sand-crack may be superficial, involving only the outer parts of the wall, or it may be deep, involving the whole thickness of the wall and the soft tissues beneath. The toe-crack is most likely to be complete—that is, extending from the coronary band to the sole—while the quarter-crack is nearly always incomplete, at least when of comparatively recent origin. Sand-cracks are most serious when they involve the coronary band in the injury. They may be complicated at any time by hemorrhage, inflammation of the laminæ, suppuration, gangrene of the lateral cartilage and of the extensor tendon, caries of the coffin bone, or the growth of a horny tumor known as a keraphyllocele.

Causes.—Relative dryness of the horn is the principal predisposing cause of sand-cracks. Excessive dryness is perhaps not a more prolific cause of cracks in the horn than alternate changes from damp to dry. It is even claimed that these injuries are more common in animals working on wet roads than those working on roads that are rough and dry; at least these injuries are not common in mountainous countries. Animals used to running at pasture when transferred to stables with hard, dry floors are more liable to quarter-cracks than those accustomed to stables. Small feet, with thick, hard hoofs, and feet which are excessively large, are more susceptible to sand-cracks than those of better proportion. A predisposition to quarter-cracks exists in contracted feet, and in those where the toe turns out or the inside quarter turns under.

Heavy shoes, large nails, and nails set too far back toward the heels, together with such diseases as canker, quittor, grease and suppurative corns, must be included as occasional predisposing causes of sand-cracks. Fast work on hard roads, jumping, and blows on the coronet, together with calk wounds of the feet, are accidental causes of quarter-cracks in particular. Toe-cracks are more likely to be caused by heavy pulling on slippery roads and pavements or on steep hills.

Symptoms.—The fissure in the horn is ofttimes the only evidence of the disease; and even this may be accidentally or purposely hidden from casual view by mud, ointments, tar, wax, putty, gutta-percha, or by the long hairs of the coronet.

Sand-cracks sometimes commence on the internal face of the wall, involving its whole thickness excepting a thin layer on the outer surface. In these cases the existence of the injury may be suspected from a slight depression, which begins near the coronary band and follows the direction of the horny fibers; but the trouble can only be positively diagnosed by paring away the outside layers of horn until the fissure is exposed. In toe-cracks the walls of the fissure are in close apposition when the foot receives the weight of the body, but when the foot is raised from the ground the fissure opens. In quarter-crack the opposite is true; the fissure closes when the weight is removed from the foot. As a rule, sand-cracks begin at the coronary band, and as they become older they not only extend downward, but they also grow deeper. In old cases, particularly in toe-crack, the horn on the borders of the fissure loses its vitality and scales off, sometimes through the greater part of its thickness, leaving behind a rough and irregular channel extending from the coronet to the end of the toe.

In many cases of quarter-crack, and in some cases of toe-crack as well, if the edges remain close together, with but little motion, the fissure is dry; but in other cases a thin, offensive discharge issues from the crack and the ulcerated soft tissues, or a funguslike growth protrudes from the narrow opening. When the cracks are deep, and the motion of their edges considerable, so that the soft tissues are bruised and pinched with every movement, a constant inflammation of the parts is maintained and the lameness is severe.

Ordinarily the lameness of sand-crack is slight when the patient walks; but it is greatly aggravated when he is made to trot, and the harder the road the worse he limps. Furthermore, the lameness is greater going down hill than up, for the reason that these conditions are favorable to an increased motion in the edges of the fissure. Lastly, more or less hemorrhage accompanies the inception of a sand-crack when the whole thickness of the wall is involved. Subsequent hemorrhages may also take place from fast work, jumping, or a misstep.

Treatment.—In so far as preventive measures are concerned, but little can be done. The suppleness of the horn is to be maintained by the use of ointments, damp floor, bedding, etc. The shoe is to be proportioned to the weight and work of the animal; the nails holding it in place are to be of proper size, and not driven too near the heels; sufficient calks and toe-pieces must be added to the shoes of horses working on slippery roads; and the evils of jumping, fast driving, etc., are to be avoided.

When a fissure has made its appearance, means are to be adopted which will prevent it from growing longer or deeper; and this can only be done by arresting all motion in the edges. The best and simplest artificial appliance for holding the borders of a toe-crack together is the Vachette clasp. These clasps and the instruments necessary for their application can be had of any prominent maker of veterinary instruments. These instruments comprise a cautery iron with which two notches are burned in the wall, one on each side of the crack, and forceps with which the clasps are closed into place in the bottom of the notches and the edges of the fissure brought close together. The clasps, being made of stiff steel wire, are strong enough to prevent all motion in the borders of the crack. Before these clasps are applied the fissure should be thoroughly cleansed and dried, and, if the injury is of recent origin, the crack may be filled with a putty made of 2 parts of gutta-percha and 1 part of gum ammoniac. The number of clasps to be used is to be determined by the length of the crack, amount of motion to be arrested, etc. Generally the clasps are from one-half to three-quarters of an inch apart. The clasps answer equally as well in quarter-crack if the wall is sufficiently thick and not too dry and brittle to withstand the strain.

In the absence of these instruments and clasps a hole may be drilled through the horn across the fissure and the crack closed with a thin nail made of tough iron, neatly clinched at both ends. A plate of steel or brass is sometimes fitted to the parts and fastened on with short screws; while this appliance may prevent much gaping of the fissure, it does not entirely arrest motion of the edges, for the simple reason that the plate and screw can not be rendered immobile.

If, for any reason, the above measures fail or can not be used, recourse must be had to an operation. The horn is softened by the use of warm baths and poultices, the patient cast, and the walls of the fissure entirely removed with the knife. The horn removed is in the shape of the letter V with the base of the coronet. Care must be taken not to injure the coronary band and the laminæ. The wound is to be treated with mild stimulant dressings, such as creolin, a weak solution of carbolic acid, tincture of aloes, etc., oakum balls, and a roller bandage. After a few days the wound will be covered with a new, white horn, and the oakum and bandages only will be needed. As the new quarter grows out the lameness disappears, and the patient may be shod with a bar shoe and returned to work.

In all cases of sand-crack the growth of horn should be stimulated by cauterizing the coronary band or by the use of blisters. In simple quarter-crack recovery will often take place if the coronet is blistered, the foot shod with a tip, and the patient turned to pasture. The shoe in toe-crack should have a clip on each side of the fissure and should be thicker at the toe than at the heels. The foot should be lowered at the heels by paring, and pared at the toe, except directly under the fissure, where it is to be pared away until it sets free from the shoe.

When any of the complications referred to above arise, special measures must be resorted to. For the proper treatment of gangrene of the lateral cartilage and extensor tendon and caries of the coffin bone reference may be had to the article on quittors. If the horny tumor should develop, it is to be removed by the use of the knife. Since this tumor develops on the inside of the horny box and may involve other important organs of the foot in disease, its removal should only be undertaken by a skillful surgeon.

LAMINITIS, OR FOUNDER.

Laminitis is a simple inflammation of the sensitive laminæ of the feet, characterized by the general phenomena attending inflammation of the skin and mucous membranes, producing no constitutional disturbances except those dependent upon the local disease, and having a strong tendency, in severe cases, to destructive disorganization of the tissues affected.

Causes.—The causes of laminitis are as wide and variable as in any of the local inflammations, and may be divided into two classes—the predisposing and the exciting. Like most other tissues, a predisposition to inflammation may be induced in the sensitive laminæ by any cause which lessens their power of withstanding the work imposed on them. It exists to an extent in those animals unaccustomed to work, particularly if they are plethoric, and in all those that have been previous subjects of the disease; for the same rule holds good here that we find in so many diseases—i. e., that one attack impairs the functional activity of the affected tissues and renders them more easy of a subsequent inflammation. Unusual excitement by determining an excessive blood supply, bad shoeing, careless paring of the feet by removing the sole support, and high calkings without corresponding toe pieces must be included under this head.

Exciting Causes.—The exciting causes of laminitis are many and varied. The most common are concussion, overexertion, exhaustion, rapid changes of temperature, ingestion of certain foods, purgatives, and the oft-mentioned metastasis.

(1) Concussion produces this disease by local overstimulation. The excessive excitement is followed by an almost complete exhaustion of the functional activity of the laminated tissues, the exhaustion by congestion, and eventually by inflammation. But congestion here, as in all other tissues, is not necessarily followed by inflammation; for, although the principal symptoms belonging to true laminitis are present, the congestion may be relieved before the processes of inflammation are fully established. This is the condition in the many so-called cases of laminitis which recover in from twenty-four to forty-eight hours. They should be called congestion of the laminæ.

Laminitis from concussion is common in trotting horses that are raced when not in condition, especially if they carry the obnoxious toe weights, and in green horses put to work on city pavements to which they are unaccustomed. Concussion from long drives on dirt roads is at times productive of the same results, notably when the weather is extremely warm, or at least when the relative change of temperature is great. But the exhaustion of these circumstances must prove an exciting cause as well as the long-continued concussion. This combination of causes must also determine the disease at times in hunters, for the weight of the rider increases the demands made upon the function of these tissues, and their powers are the sooner exhausted.

(2) Overexertion, as heavy pulling or rapid work, even where there is no immoderate concussion, occasionally results in this disease; but here also exhaustion is a conjunctive cause, for overexertion can not be long continued without exhaustion.

(3) Exhaustion is nearly as prolific a source of laminitis as is concussion; for when the physical strength is impaired, even though temporarily, some part of the economy is rendered more vulnerable to disease than others. To this cause we must ascribe those cases which follow a hard day's work, where at no time has there been overexertion or immoderate concussion.

Where one foot has been blistered, or where one limb is incapacitated from any cause, the opposite member, doing double duty, soon becomes exhausted, and congestion, followed by inflammation, results. Where one foot only becomes laminitic, it is customary to find the corresponding member participating at a later date; not always because of sympathy, but because one foot had to do the work of two.

(4) Rapid changes of temperature act as an exciting cause of laminitis by impairing the normal blood supply. This change of temperature may be induced by drinking large quantities of cold water while in an overheated condition. Here the internal heat is rapidly reduced, the neighboring tissues and blood vessels constrained, and the blood supply of these organs greatly diminished, while the quantity sent to the surface is correspondingly increased. A cold wind or relatively cold air allowed to play upon the body when heated and wet with sweat has virtually the same result, for it arrests evaporation and rapidly cools the external surface, thereby determining an excess of blood to such organs and tissues as are protected from this outside influence.

A more limited local action of cold may excite this disease, by driving through water or washing the feet and legs while the animal is warm or just in from work. Here a very marked reaction takes place in the surface tissues of the limbs, and passive congestion of the foot results from an interference with the return flow of blood which is being sent to these organs in excess. These are more apt to be simple cases of congestion, soon to recover, yet they may become true cases of laminitis.

(5) Why it is that certain kinds of grain will cause laminitis does not seem to be clearly understood. Certainly they possess no specific action upon the laminæ, for all animals are not alike affected, neither do they always produce these results in the same animal.

Some of these foods cause a strong tendency to indigestion, and the consequent irritation of the alimentary canal may be so great as to warrant the belief that the laminæ are affected through sympathy. In other instances there is no apparent interference with digestion nor evidence of any irritation of the mucous membranes, yet the disease is in some manner dependent upon the food for its inception. Barley, wheat, and sometimes corn are the grains most apt to cause this disease.

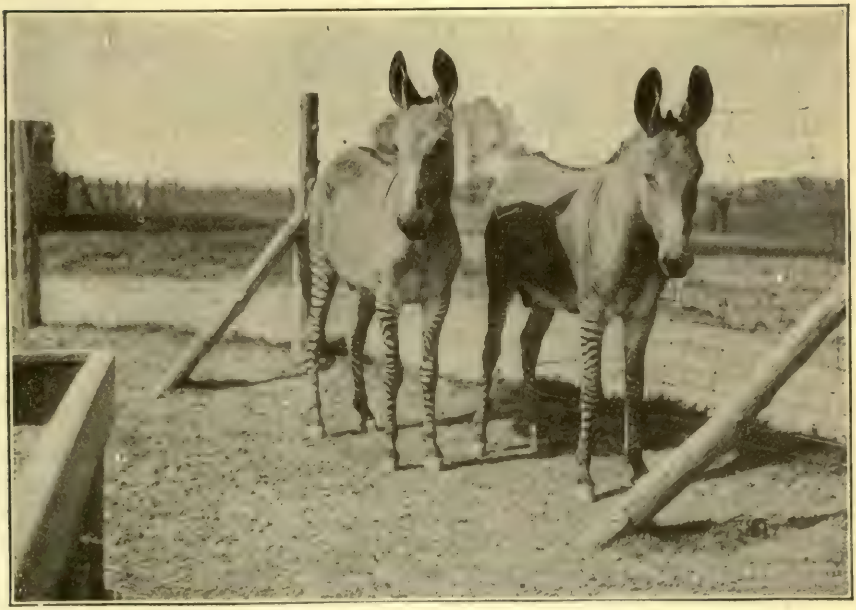
(6) Fortunately purgative medicines rarely cause inflammation of the laminæ. That it is, then, the result of sympathetic action is no doubt more than hypothetical, for when there is no derangement of the alimentary canal a dose of cathartic medicine will at times bring on severe laminitis.

(7) Most all the older authorities were agreed that metastatic laminitis is a reality. However, it is believed that metastatic laminitis is nothing more nor less than concurrent laminitis, and presents little in any way peculiar outside the imperfectly understood exciting cause. The practitioner who allows the acute symptoms of the laminitis to mislead him, simply because their severity has overshadowed those of the primary disease, may lose his case through unguarded subsequent treatment. This form of laminitis is by no means commonly met with. It may be found in conjunction with pneumonia, according to Youatt with inflammation of the bowels and eyes, and according to Law and Williams sometimes with bronchitis.

Symptoms.—Laminitis is characterized by a congregation of symptoms so well marked as scarcely to be misinterpreted by the most casual observer. They are nearly constant in their manifestations, modified by the number of feet affected, the cause which has induced the disease, the previous condition of the patient, and the various other influences which operate in all diseases to some extent. They may be divided into general symptoms, which are concomitants of all cases of the disease, subject to variations in degree only, and special symptoms, or those which serve to determine the feet affected and the complications which may arise.

General Symptoms.—Usually, the first symptom is the interference with locomotion. Occasionally the other symptoms are presented first. As the lameness develops the pulse becomes accelerated, full, hard, and strikes the finger strongly; the temperature soon rises several degrees above the normal, reaching sometimes 106° F.; it generally ranges between 102.5° and 105° F. The respirations are rapid and panting in character, the nostrils widely dilated, and the mucous membranes highly injected. The facial expression is anxious and indicative of the most acute suffering, while the body is more or less bedewed with sweat. At first there may be a tendency to diarrhea, or it may appear later as the result of the medicines used. The urine is high colored, scant in quantity, and of increased specific gravity, owing to the water being eliminated by the skin instead of the kidneys. The appetite is impaired, sometimes entirely lost, but thirst is greatly increased. The affected feet are hot and

Tuberculous Hogs Infected by Working Over a Pile of Manure from Tuberculous Cattle. Year Book, 1909.



Zebra-Ass Hybrids. Dept. of Agr.

dry, and are relieved as much as possible from bearing weight. Rapping them with a hammer, or compelling the animal to stand upon one affected member, causes intense pain. The artery at the fetlock throbs beneath the finger.

Specific Symptoms.—Liability to affection varies in the different feet according to the exciting cause. Any one or more of the feet may become the subject of this disease, although it appears more often in the fore feet than in the hind ones. This is due to the difference of function, *i. e.*, that the fore feet are the bases of the columns of support, receiving nearly all of the body weight during progression and consequently most of the concussion, while the hind feet become simply the fulcra of the levers of progression, and are almost exempt from concussion.

One Foot.—Injuries and excessive functional performance are the causes of the disease in only one foot. The general symptoms, as a rule, are not severe, there being often no loss of appetite and no unusual thirst, while the pulse, temperature, and respiration remain about normal. The weight of the body is early thrown upon the opposite foot, and the affected one is extended, repeatedly raised from the floor, and then carefully replaced. When made to move forward the lame foot is either carried in the air while progression is accomplished by hopping with the healthy one, or else the heel of the first is placed upon the ground and receives little weight while the sound limb is quickly advanced. Progression in a straight line is more easy than turning toward the lame side.

Both Fore Feet.—When both fore feet are affected the symptoms are well marked. The lameness is excessive and the animal almost immovable. When standing the head hangs low down, or rests upon the manger as a means of support and to relieve the feet; the fore feet are well extended so that the weight is thrown upon the heels, where the tissues are least sensitive, least inflamed, and most capable of relief by free effusion. The hind feet are brought forward beneath the body to receive as much weight as possible, thereby relieving the diseased ones. If progression is attempted, which rarely happens voluntarily during the first three or four days, it is accomplished with very great pain and lameness at the starting, which usually subsides to an extent after a few minutes' exercise.

In a majority of cases of laminitis in the fore feet the animal persists in standing until he is nearly recovered. In other cases he as persistently lies, standing only when necessity seems to compel it, and then for as short a time as possible. If the recumbent position is once assumed, the relief experienced tempts the patient to seek it again; and so we often find him down a greater part of the time. But this is not true of all cases; sometimes he will make the experiment, then cautiously guard against a repetition. Even in cases of enforced recumbency, he ofttimes takes advantage of the first opportunity and gets upon his feet, doggedly remaining there until again laid upon his side.

Both Hind Feet.—When only both hind feet are affected, they are, while standing, maintained in the same position as when only the fore ones are the subjects of the disease, but with an entirely different object in view. Instead of being there to receive weight, they are so advanced that the heels only may receive what little weight is necessarily imposed on them; the fore feet at the same time are placed well back beneath the body, where they become the main supports.

Progression is even more difficult now than when the disease is confirmed to the anterior extremities. The fore feet are dubiously advanced a short distance and the hind ones brought forward with a sort of kangaroo hop, that results in an apparent loss of equilibrium which the animal is a few moments in regaining. The general symptoms, or, in other words, the degree of suffering, seem more severe than where the disease affects the fore feet alone. The standing position is not often maintained, the patient seeking relief in recumbency. This fact is easily understood when we consider how cramped and unnatural is the position he assumes while standing and, if it were maintained for any considerable length of time, would, no doubt, excite the disease in the fore feet.

All Four Feet.—Laminitis of all four feet is but uncommonly met with. In all these the position assumed was nearly normal. All the feet were slightly advanced, and first one, then another, momentarily raised from the ground and carefully replaced, this action being kept up almost continually during the time the animal remained standing. The suffering is most acute, the appetite lost, and, although the patient lies most of the time, the temperature remains too high. The pulse and respirations are greatly accelerated, the body covered with sweat, and bed sores are unpleasant accompaniments.

Course.—The course which laminitis takes varies greatly in different cases, being influenced more or less by the exciting cause, the animal's previous condition, the acuteness of the attack, and the subsequent treatment. The first symptoms rarely exhibit themselves while the animal is at his work, although we occasionally see the gait impaired by stumbling, the body covered with a profuse sweat, and the respirations becoming blowing in character as premonitions of the oncoming disease; but, as a rule, nothing is noted amiss with the animal until he has stood for some time after coming in from work, when, in attempting to move him, he is found very stiff. Like all congestions, the early symptoms usually develop rapidly; yet this is not always the case, for often there appears to be no well-defined period of congestion, the disease seemingly commencing at a point and gradually spreading until a large territory is involved in the morbid process.

Simple Congestion.—Those cases of simple congestion of the laminæ, which we erroneously call laminitis, are rapidly developed, the symptoms are but moderately severe, and but one to three days required for recovery. There are no structural changes and but a moderate exudate. This is rapidly reabsorbed, leaving the parts in the same condition as they were previous to the attack. If the congestion has been excessive, a rupture of some of the capillaries will be found, a condition more apt to obtain where the animal is made to continue work after a development of symptoms has begun.

Acute.—In the acute form of laminitis the symptoms may all develop rapidly, or it may commence by the appearance of a little soreness of the feet which in twenty-four or forty-eight hours develops into a well-marked case. This peculiarity of development is due to one of two causes. Either the congestion is general, but takes place slowly, or else it begins in one or more points and gradually spreads throughout the laminæ. These acute cases generally run their course in from one to two weeks. Usually a culmination of the symptoms is reached, if the patient is properly treated, in from three to five days; then evidences of recovery are discernible in favorable cases. The lameness improves, the other symptoms gradually subside, and eventually health is regained. It is in these cases that a strong tendency to disorganization of a destructive character exists, hence it is we see so many recover imperfectly with marked structural changes permanently remaining.

Subacute.—Subacute laminitis is most often seen as a termination of the acute form, although it may exist independent of or precede an acute attack. It is characterized by the mildness of its symptoms, slow course, and moderate tissue changes. It may be present a long time before any pathological lesions result other than those found in the acute form, and when these changes do take place they should rather be viewed as complications.

Chronic.—Chronic laminitis is a term used by many to designate any of the sequelæ of the acute and subacute forms of this disease.

Complications.—Complications concurrent with or supervening upon laminitis are frequent and varied, and are often dependent upon causes not fully understood. Excessive purgation is one of the simplest of these, and not usually attended with dangerous consequences. It rarely occurs unless induced by a purgative, and the excessive action of the medicine is probably to be explained upon the theory that the mucous membrane sympathizes with the diseased laminæ, is irritable, and readily becomes overexcited. The discharges are thin and watery, sometimes offensively odorous, and occasionally persist in spite of treatment. It may prove disastrous to the welfare of the patient by the rapid exhaustion which it causes, preventing resolution of the laminitis, and may even cause death.

Sidebones.—A rapid development of sidebones is one of the complications, or, perhaps better, a sequel of laminitis not often met with in practice. Here the inflammatory process extends to the lateral cartilages, with a strong tendency to calcification. The deposition of the lime salts is sometimes most rapid, so that the "bones" are developed in a few weeks; in other instances they are deposited slowly and their growth is not noted until long after the subsidence of the laminitis, so that the exciting cause is not suspected.

Suppuration of the sensitive membrane is a somewhat common complication, and even when present in its most limited form is always a serious matter; but when it becomes extensive, and especially where the suppurative process extends to the periosteum, the results are apt to be fatal.

Pumiced sole is that condition in which the horny sole in the neighborhood of the toe readily crumbles away and leaves the sensitive tissues more or less exposed. It is not a complication of laminitis only, for it is seen under other conditions. This crumbling horn, when critically examined, shows almost an entire absence of the cohesive matter which unites the healthy fibers, while the fibers themselves are irregular and granular in appearance. Pumiced sole depends upon an impairment of the horn-secreting powers of the sensitive sole, or upon a separation of the horny from the soft tissues which maintain its vitality.

Treatment.—The treatment of laminitis is probably more varied than in any other disease, and yet a large number of cases recover for even the poorest practitioner. To guard against and prevent disease, or to render an unpreventable attack less serious than it otherwise would be, is the highest practice of the healing art. In a disease so prone to result from the simplest causes, especially when the soundest judgment may not be able to determine the extent of the disease-resisting powers of the tissues which are liable to be affected, or of what shall in every instance constitute an overexcitement, it is not strange that horse owners find themselves in trouble from unintentional transgression. If the disease was dependent upon specific causes, or if the stability of the tissues were of a fixed or more nearly determinate quality, some measures might be instituted that would prove generally preventive. But the predisposing causes are common conditions and often cannot be remedied. That which is gentle work in one instance may incite disease in another. That which is food today may tomorrow prove disastrous to health. Finally, necessary medical interference, no matter how judicious, may cause a more serious complaint than that which was being treated. Notwithstanding these difficulties there are some general rules to be observed that will in part serve to prevent the development of an unusual number of cases. First of all the predisposing causes must be removed where possible; when this is impossible unusual care must be taken not to bring into operation an exciting cause. Fat animals should, under no circumstances, have hard work. If the weather is warm or the variation of temperature great, all horses should have but slow, gentle labor until they become inured to it, the tissues hardened, and their excitability reduced to a minimum. Green horses should have moderate work, particularly when taken from the farm and dirt roads to city pavements; for increased concussion, changed hygienic conditions, and artificial living readily become active causes of the disease under these circumstances. Army horses just out of winter quarters, track horses with insufficient preparation, and farmers' horses put to work in the spring are among the most susceptible classes, and must be protected by work that is easy and gradual. If long marches or drives are imperative, the incumbrances must be as light as possible and the journey interspersed with frequent rests, for this allows the laminæ to regain their impaired functional activity and to withstand much more work without danger. Furthermore, it permits early detection of an attack, and prevents working after the disease begins, which renders subsequent medication more effective by cutting the progress short at the stage of congestion.

All animals when resting immediately after work should be protected from cold air or drafts. If placed in a stable that is warm and without draft, no covering is necessary; under opposite conditions blankets should be used until the excitement and exhaustion of labor have entirely passed away. It is still better that all animals coming in warm from work be cooled out by slow walking until the perspiration has dried and the circulation and respiration are again normal. Animals stopped on the road even for a few moments should always be protected from rapid change of temperature by appropriate clothing. If it can be avoided, horses that are working should never be driven or ridden through water. If unavoidable, they should be cooled off before passing through, and then kept moving until completely dried. The same care is to be practiced with washing the legs in cold water when just in from work, for occasionally it proves the cause of a most acute attack of this disease.

Unusual changes in the manner of applying the shoes should not be hastily made. If a plane shoe has been worn, high heels or toes must not be substituted at once; but the change, if necessary, should gradually be made, so that the different tissues may adapt themselves to the altered conditions. If the radical changes are imperative, as is sometimes the case, the work must be so reduced in quantity and quality that it can not excite the disease.

Laminitis from the effects of purgatives can scarcely be guarded against. The trouble does not seem to depend upon the size of the purgative, the length of time before purgation begins, or the activity and severity with which the remedy acts. Medicines known to have unusual irritating effects on the alimentary canal should be used only when necessity demands it, and then in moderate doses.

Experience alone will determine what animals are liable to suffer from this disease through the use of foods. When an attack can be ascribed to any particular food it should be withheld, unless in small quantities. Horses that have never been fed upon Indian corn should receive but a little of it at a time, mixed with bran, oats, or other food, until it has been determined that no danger exists. Corn is less safe in warm than in cold weather, and for this reason it should always be fed with caution during spring and summer months.

When an animal is excessively lame in one foot the shoe of the opposite member should be removed, and cold water frequently applied to the well foot. At the same time use the slings if the subject remains standing. Horses should under no circumstances be overworked; to guard against this, previous work, nature of roads, state of weather, and various other influences must be carefully considered. Watering while warm is a pernicious habit, and, unless the animal is accustomed to it, is apt to result in some disorder, ofttimes in laminitis.

Curative Measures.—In cases of simple congestion of the laminæ the body should be warmly clothed and warm drinks administered. The feet should be placed in a warm bath to increase the return flow of blood. In course of an hour the feet may be changed to cold water and kept there until recovery is completed. If the constitutional symptoms demand it, diuretics should be given. Half-ounce doses of saltpeter, three times a day in the water, answer the purpose. In cases of active congestion the warm footbaths should be omitted and cold ones used from the commencement. Subacute laminitis demands the same treatment, with laxatives if there is constipation, and the addition of low-heeled shoes. The diuretics may need to be continued for some time and their frequency increased. Regarding acute laminitis, what has been called the American treatment is simple and efficient. It consists solely in the exhibition of large doses of nitrate of potash and the continued application to the feet and ankles of cold water.

Three to 4 ounces of saltpeter in a pint of water, repeated every six hours, is the proper dose. The laminitis frequently subsides within a week. These large doses may be continued for a week without danger. The feet should be kept in a tub of water at a temperature of 45° to 50° F., unless the animal is lying down, when swabs are to be used and wet every half hour with the cold water. The water keeps the horn soft and moist and acts directly upon the inflamed tissues by reducing the temperature. Cold maintains the vitality and disease-resisting qualities of the soft tissues, tones up the coats of the blood vessels, diminishes the supply of blood, and limits the exudation. Furthermore, cold has an anesthetic effect upon the diseased tissues and relieves the pain.

Aconite may be given in conjunction with the niter where the heart is greatly excited and beats strongly. Ten-drop doses, repeated every two hours for twenty-four hours, are sufficient. The use of cathartics is dangerous, for they may excite superpurgation. Usually the niter will relieve the constipation, yet if it should prove obstinate, laxatives may be carefully given. Bleeding, both general and local, should be guarded against. The shoes must be early removed and the soles left unpared.

Paring of the soles presents two objections: First, while it may temporarily relieve the pain by relieving pressure, it favors greater exudation, which may more than counterbalance the good effects. Secondly, it makes the feet tender and subject to bruises when the animal again goes to work. The shoes should be replaced when convalescence sets in and the animal is ready to take exercise. Exercise should never be enforced until the inflammation has subsided; for although it temporarily relieves the pain and soreness, it maintains the irritation, increases the exudation, and postpones recovery.

If at the end of the fifth or sixth day prominent symptoms of recovery are not apparent, apply a stiff blister of cantharides around the coronet and omit the niter for about forty-eight hours. When the blister is well set, the feet may again receive wet swabs. If one blister does not remove the soreness it may be repeated, or the actual cautery applied. The same treatment should be adopted where sidebones form or inflammation of the coronet bone follows. When the sole breaks through, exposing the soft tissues, the feet must be carefully shod with thin heels and thick toes where there is a tendency to walk on the heels, and the sole must be well protected with appropriate dressings and pressure over the exposed parts. When there is turning up of the toe, blistering of the coronet, *in front only,* sometimes stimulates the growth of horn, but as a rule judicious shoeing is the only treatment that will enable the animal to do light, slow work.

Where suppuration of the laminæ is profuse, it is better to destroy your patient at once and relieve his suffering; but if the suppuration is limited to a small extent of tissue, especially of the sole, treatment, as in acute cases, may induce recovery and should always be tried. If from bed sores or other causes septicemia or pyemia is feared, the bisulphite of soda, in half-ounce doses, may be given in conjunction with tonics and such other treatment as is indicated in these diseases.

The propriety of insisting upon enforced recumbency is doubted, as the patient usually assumes whatever position gives most comfort. No doubt recumbency diminishes the amount of blood sent to the feet, and may greatly relieve the pain, so that forcing the patient to lie down may be tried, yet should not be renewed if he thereafter persists in standing.

Where the animal persistently stands, or where constant lying indicates it (to prevent extensive sores), the patient should be placed in slings. When all four feet are affected it may be impossible to use slings, for the reason that the patient refuses to support any of his weight and simply hangs in them. Lastly, convalescent cases must not be returned to work too early, else permanent recovery may never be effected.—(Spl. Rpt. Horse, Dept. Agr., 1911; S. C. E. S. B. 23, 26; Miss. E. S. B. 31.)

DISEASES OF THE SKIN.

The diseases of the skin are very numerous and complex, which may be largely accounted for by the fact that the cutaneous covering is exposed to view at all points, so that shades of difference in inflammatory and other diseased processes are easily seen and distinguished from one another. In the horse the hairy covering serves to some extent to mask the symptoms, and hence the nonprofessional man is tempted to apply the term mange to all alike, and it is only a step further to apply the same treatment to all these widely different disorders. Yet even in the hairy quadruped the distinction can be made in a way which can not be done in disorders of that counterpart and prolongation of the skin—the mucous membrane, which lines the air passages, the digestive organs, the urinary and generative apparatus. Diseased processes, therefore, which in these organs it might be difficult or impossible to distinguish from one another, can usually be separated and recognized when appearing in the skin.

Nor is this differentiation unimportant. The cutaneous covering presents such an extensive surface for the secretion of cuticular scales, hairs, horn, sebaceous matter, sweat, and other excretory matters, that any extensive disorder in its functions may lead to serious internal disease and death. Again, the intimate nervous sympathy of different points of the skin with particular internal organs renders certain skin disorders causative of internal disease and certain internal diseases causative of affections of the skin. The mere painting of the skin with an impermeable coating of glue is speedily fatal; a cold draft striking on the chest causes inflammation of the lungs or pleura; a skin eruption speedily follows certain disorders of the stomach, the liver, the kidneys, or even the lungs; simple burns of the skin cause inflammations of internal organs, and inflammations of such organs cause in their turn eruptions on the skin. The relations—nervous, secretory, and absorptive—between the skin and internal organs are most extensive and varied, and therefore a visible disorder in the skin may point at once and specifically to a particular fault in diet, to an injudicious use of cold water when the system is heated, to a fault in drainage, ventilation, or lighting of the stables, to indigestion, to liver disease, to urinary disorder, etc.

STRUCTURE OF THE SKIN.

The skin consists primarily of two parts: (1) The superficial non-vascular (without blood vessels) layer, the cuticle, or epidermis; and (2) the deep vascular (with blood vessels) layer, the corium, dermis, or true skin. The cuticle is made up of cells placed side by side and more or less modified in shape by their mutual compression and by surface evaporation and drying. The superficial stratum consists of the cells dried in the form of scales, which fall off continually and form dandruff. The deep stratum (the mucous layer) is formed of somewhat rounded cells with large central nuclei, and in colored skin containing numerous pigment granules. These cells have prolongations, or branches, by which they communicate with one another and with the superficial layer of cells in the true skin beneath. Through these prolongations they receive nutrient liquids for their growth and increase, and pass on liquids absorbed by the skin into the vessels of the true skin beneath. The living matter in the cells exercises an equally selective power on what they shall take up for their own nourishment and on what they shall admit into the circulation from without. Thus, certain agents, like iodine and belladonna, are readily admitted, whereas others, like arsenic, are excluded by the sound, unbroken epidermis. Between the deep and superficial layers of the epidermis there is a thin translucent layer consisting of a double stratum of cells, and forming a medium of transition from the deep spheroidial to the superficial scaly cuticle.

The true skin, or dermis, has a framework of interlacing bundles of white and yellow fibers, large and coarse in the deeper layers, and fine in the superficial, where they approach the cuticle. Between the fibrous bundles are left interspaces which, like the bundles, become finer as they approach the surface, and inclose cells, vessels, nerves, glands, gland ducts, hairs, and in the deeper layers fat.

The superficial layer of the dermis is formed into a series of minute conical elevations, or papilla, projecting into the deep portion of the cuticle, from which they are separated by a very fine transparent membrane. This papillary layer is very richly supplied with capillary blood vessels and nerves, and is at once the seat of acute sensation and the point from which the nutrient liquid is supplied to the cells of the cuticle above. It is also at this point that the active changes of inflammation are especially concentrated; it is the immediately superposed cell layers that become morbidly increased in the earlier stages of inflammation; it is on the surface of the papillary layer that the liquid is thrown out which raises the cuticle in the form of a blister, and it is at this point mainly that pus forms in the ordinary pustule.

The fibrous bundles of the true skin contain plain muscular fibers, which are not controlled by the will, but contract under the influence of cold and under certain nervous influences, as in some skin diseases and in the chill of a fever, and lead to contraction, tightening, or corrugation of the skin, contributing to produce the hidebound of the horseman. Other minute muscular filaments are extended from the surface of the dermis to the hair follicle on the side to which the hair is inclined, and under the same stimulating influences produce that erection of the hair which is familiarly known as staring coat. Besides these, the horse's skin is furnished with an expansion of red voluntary muscle, firmly attached to the fibrous bundles, and by which the animal can not only dislodge insects and other irritants, but even shake off the harness. This fleshy envelope covers the sides of the trunk and the lower portions of the neck and head, the parts unprotected by the mane and tail, and serves to throw the skin of these parts into puckers, or ridges, in certain irritating skin diseases.

The hairs are cuticular products growing from an enlarged papilla lodged in the depth of a follicle or sac, hollowed out in the skin and extending to its deepest layers. The hair follicle is lined by cells of epidermis, which at the bottom are reflected on the papilla and become the root of the hair. The hair itself is formed of the same kind of cells firmly adherent to each other by a tough intercellular substance, and overlapping each other like slates on a roof in a direction toward the free end.

The sebaceous glands are branching tubes ending in follicles or sacs and opening into the hair follicles, lined by a very vascular fibrous network representing the dermis, and an internal layer of cells representing the mucous layer of the cuticle. The oily secretion gives gloss to the hair and prevents its becoming dry and brittle, and keeps the skin soft and supple, protecting it at once against undue exhalation of water and undue absorption when immersed in that medium. Besides those connected with the hair follicles there are numerous isolated sebaceous glands, opening directly on the surface of the skin, producing a somewhat thicker and more odorous secretion. These are found in large numbers in the folds of the skin, where chafing would be likely if the surface were dry, as on the sheath, scrotum, mammary glands, and inner side of the thigh, around the anus and vulva, in the hollow of the heel, beneath the fine horn of the frog, on the inner side of the elbow, on the lips, nostrils, and eyelids. When closed by dried secretion or otherwise these glands may become distended so as to form various-sized swellings on the skin, and when inflamed they may throw out offensive liquid discharges, as in grease, or produce red, tender fungous growths.

The sweat glands of the horse, like those of man, are composed of simple tubes, which extend down through the cuticle and dermis in a spiral manner, and are coiled into balls in the deeper layer of the true skin. In addition to their importance in throwing offensive waste products out of the system, these glands tend to cool the skin and the entire economy of the animal through the evaporation of their watery secretion. Their activity is therefore a matter of no small moment, as besides regulating the animal heat and excreting impurities, they influence largely the internal organs through the intimate sympathy maintained between them and the skin. Diseases of the skin may be conveniently divided, according to their most marked features, into the following classes:

(1) Those in which congestion and inflammation are the most marked features, varying according to the grade or form into (a) congestion with simple redness, dryness, and heat, but no eruption (*erythema*); (b) inflammation with red-pointed elevations, but no blisters (*papules*); (c) inflammation with fine conical elevations, each surmounted by a minute blister (*vesicle*); (d) inflammation with a similar eruption but with larger blisters, like half a pea and upwards (*bullæ*); (e) inflammation with a similar eruption, but with a small sac of white creamy pus on the summit of each elevation (*pustules*); (f) the formation of pustules implicating the superficial layer of true skin, a small portion of which dies and is thrown off as a slough, or core (boils); (g) the formation of round, nodular, transient swellings in the true skin (*tubercles*); and (h) the excessive production of scales, or dandruff (scaly or squamous affections). (2) Diseases in which there are only deranged sensations of itching, heat, tenderness, etc. (*neurosis.*) (3) Diseased growths, such as warts, callosities, horny growths, cancer, etc. (4) Diseases due to parasites, animal and vegetable. (5) Diseases connected with a specific poison, such as horsepox, erysipelas, anthrax, farcy, or cutaneous glanders, etc. (6) Physical injuries, like wounds, burns, scalds, etc.

CONGESTION (RED EFFLORESCENCE, OR ERYTHEMA).

This is a congested or slightly inflamed condition of the skin, unattended by any eruption. The part is slightly swollen, hot, tender, or itchy, and dry, and if the skin is white there is redness. The redness is effaced by pressure, but reappears instantly when the pressure is removed. Unless in transient cases the hairs are liable to be shed. It may be looked on as the first stage of inflammation, and therefore when it becomes aggravated it may merge in part or in whole into a papular, vesicular, or pustular eruption.

Erythema may arise from a variety of causes, and is often named in accordance with its most prominent cause. Thus the chilling, or partial freezing, of a part will give rise to a severe reaction and congestion. When snowy or icy streets have been salted this may extend to severe inflammation with vesicles, pustules, or even sloughs of circumscribed portions of the skin of the pastern (chilblain, frostbite). Heat and burning have a similar effect, and this often comes from exposure to the direct rays of the sun. The skin that does not perspire is the most subject, and hence the white face or white limb of a horse becoming dried by the intensity of the sun's rays often suffers to the exclusion of the rest of the body (white face and foot disease). The febrile state of the general system is also a potent cause, hence the white-skinned horse is rendered the more liable if kept on a heating ration of buckwheat, or even of wheat or maize. Contact of the skin with oil of turpentine or other essential oils, with irritant liquids, vegetable or mineral, with rancid fats, with the acrid secretions of certain animals, like the irritating toad, with pus, sweat, tears, urine, or liquid feces, will produce congestion or even inflammation. Chafing is a common cause, and is especially liable to affect the fat horse between the thighs, by the side of the sheath or scrotum, on the inner side of the elbow, or where the harness chafes on the poll, shoulder, back, breastbone, and under the tail. The accumulation of sweat and dust between the folds of the skin and on the surface of the harness, and the specially acrid character of the sweat in certain horses contribute to chafing or intertrigo. The heels often become congested, owing to the irritation caused by the short bristly hairs in clipped heels. Again, congestion may occur from friction by halter, harness, or other foreign body under the pastern, or inside the thigh or arm, or by reason of blows from another foot. Finally erythema is especially liable to occur in spring when the coat is being shed, and the hair follicles and general surface are exposed and irritable in connection with the dropping of the hairs.

If due only to a local irritant, congestion will usually disappear when such cause has been removed, but when the feeding or system is at fault these conditions must be first corrected. While the coat is being shed the susceptibility will continue, and the aim should be to prevent the disease developing and advancing so as to weaken the skin, render the susceptibility permanent, and lay the foundation of persistent or frequently recurring skin disease. Hence at such times the diet should be nonstimulating; any excess of grain, and above all of buckwheat, Indian corn, or wheat, being avoided. A large grain ration should not be given at once on return from hard work, when the general system and stomach are unable to cope with it; the animal should not be given more than a swallow or two of cold water when perspiring and fatigued; nor should he be allowed a full supply of water just after his grain ration; he should not be overheated or exhausted by work, nor should dried sweat and dust be allowed to accumulate on the skin or on the harness pressing on it. The exposure of the affected heels to damp, mud, and snow, and, above all, to melting snow, should be guarded against; light, smooth, well-fitting harness must be secured, and where the saddle or collar irritates an incision should be made in them above and below the part that chafes, and, the padding between having been removed, the lining should be beaten so as to make a hollow. A zinc shield in the upper angle of the collar will often prevent chafing in front of the withers.

Treatment.—Wash the chafed skin and apply salt water (one-half ounce to the quart), extract of witch-hazel, a weak solution of oak bark, or camphorated spirit. If the surface is raw use bland powders, such as oxide of zinc, lycopodium, starch, or smear the surface with vaseline, or with 1 ounce of vaseline intimately mixed with one-half dram each of sugar of lead and opium. In cases of chafing rest must be strictly enjoined. Where there is constitutional disorder or acrid sweat, 1 ounce cream of tartar or a teaspoonful of bicarbonate of soda may be given twice daily.

CONGESTION, WITH SMALL PIMPLES, OR PAPULES.

In this affection there is the general blush, heat, etc., of erythema, together with a crop of elevations from the size of a poppy seed to a coffee bean, visible when the hair is reversed or to be felt with the finger where the hair is scanty. In white skins they vary from the palest to the darkest red. All do not retain the papular type, but some go on to form blisters or pustules, or dry up into scales, or break out into open sores, or extend into larger swellings. The majority, however, remaining as pimples, characterize the disease. When very itchy the rubbing breaks them open, and the resulting sores and scales hide the true nature of the eruption.

The general and local causes may be the same as for erythema, and in the same subject one portion of the skin may have simple congestion and another adjacent papules. As the inflammatory action is more pronounced, so the irritation and itching are usually greater, the animal rubbing and biting himself severely. This itching is especially severe in the forms which attack the roots of the mane and tail, and there the disease is often so persistent and troublesome that the horse is rendered virtually useless. The bites of insects often produce a papular eruption, but in many such cases the swelling extends wider into a buttonlike elevation, one-half to an inch in diameter. The same remarks apply to the effects of the poison ivy and poison sumac.

Treatment.—In papular eruption first remove the cause, then apply the same general remedies as for simple congestion. In the more inveterate cases use a lotion of one-half ounce sulphide of potassium in 2 quarts of water, to which a little Castile soap has been added; or use a wash with one-half ounce oil of tar, 2 ounces Castile soap, and 20 ounces water.

INFLAMMATION WITH BLISTERS, OR ECZEMA.

In this the skin is congested, thickened, warm (white skins are reddened), and shows a thick crop of little blisters formed by effusions of a straw-colored fluid between the true skin and the cuticle. The blisters may be of any size from a millet seed to a pea, and often crack open and allow the escape of the fluid, which concretes as a slightly yellowish scab or crust around the roots of the hairs. This exudation and incrustation are especially common where the hairs are long, thick, and numerous, as in the region of the pastern of heavy draft horses. The term eczema is now applied very generally to eruptions of all kinds that depend on internal disorders or constitutional conditions, and that tend to recurrences and inveteracy. Eczema may appear on any part of the body, but in horses it is especially common on the heels and the lower parts of the limbs, and less frequently on the neck, shoulder, and abdomen. The limbs appear to be especially liable because of their dependent position, all blood having to return from them against the action of gravity, and congestions and swellings being common, because of the abundance of blood vessels in this part of the skin, and because of the frequent contact with the irritant dung and urine and their ammoniacal emanations. The legs further suffer from contact with wet and mud when at work, from snow and ice, from drafts of cold air on the wet limbs, from washing with caustic soaps, or from the relaxing effects of a too deep and abundant litter. Among other causes may be named indigestion and the presence of irritant matters in the blood and sweat, the result of patent medicated foods and condition powders (aromatics, stimulants), green food, new hay, new oats, buckwheat, wheat, maize, diseased potatoes, smut, or ergot, in grains, decomposing green food, brewers' grains, or kitchen garbage. The excitement in the skin, caused by shedding the coat, lack of grooming, hot weather, hot, boiled or steamed food, conduces to the eruption. Lastly, any sudden change of food may induce it.

The blisters may in part go on to suppuration so that vesicles and pustules often appear on the same patch, and when raw from rubbing the true nature of the eruption may be completely masked. In high-fed horses, kept in close stables with little work, eczema of the limbs may last for months and years. It is a very troublesome affection in draft stallions.

Treatment.—This disease is so often the result of indigestion that a laxative of 1 pound Glauber's salts, in 3 or 4 quarts water or 1½ pints olive oil, is often demanded to clear away irritants from the alimentary canal. Following this, in recent and acute cases, give 2 drams of acetate or bicarbonate of potash twice a day in the drinking water. If the bowels still become costive, give daily 1 ounce sulphate of soda and 20 grains powdered nux vomica. In debilitated horses combine the nux vomica with one-half ounce powdered gentian root. As a wash for the skin use 1 dram bicarbonate of soda and 1 dram carbolic acid in a quart of water, after having cleansed the surface with tepid water. Employ the same precautions as regards feeding, stabling, and care of harness as in simple congestion of the skin.

In the more inveterate forms of eczema more active treatment is required. Soak the scabs in fresh sweet oil, and in a few hours remove these with tepid water and Castile soap; then apply an ointment of sulphur or iodide of sulphur day by day. If this seems to be losing its effect after a week, change for mercurial ointment or a solution of sulphid of potassium, or of hyposulphite of soda, 3 drams to the quart of water. In these cases the animal may take a course of sulphur (1 ounce daily), bisulphite of soda (one-half ounce daily), or of arsenic (5 grains daily) mixed with 1 dram bicarbonate of soda.

INFLAMMATION WITH PUSTULES.

In this affection the individual elevations on the inflamed skin show in the center a small sac of white, creamy pus in place of the clear liquid of a blister. They vary in size from a millet seed to a hazelnut. The pustules of glanders are to be distinguished by the watery contents and cordlike swelling, extending from the pustules along the line of the veins, and those of boils by the inflammation and sloughing out of a core of the true skin. The hair on the pustule stands erect, and is often shed with the scab which results. When itching is severe the parts become excoriated by rubbing, and, as in the other forms of skin disease, the character of the eruption may become indistinct. Old horses suffer mainly at the root of the mane and tail and about the heels, and suckling foals around the mouth, on the face, inside the thighs, and under the tail.

Pustules like eczema are especially liable to result from unwholesome food and indigestion, from a sudden change of food—above all from dry to green food. In foals it may result from overheating of the mare and allowing the first milk after she returns, or by milk rendered unwholesome by faulty feeding of the dam. If a foal is brought up by hand the souring and other decompositions in the milk derange the digestion and cause such eruption. Vetches and other plants affected with honeydew and buck-wheat have been the cause of these eruptions on white portions of the skin. Disorders of the kidneys or liver are common causes of this affection.

Treatment.—Apply soothing ointments, such as benzonated oxide of zinc, or vaseline with 1 dram oxide of zinc in each ounce. Or a wash of 1 dram sugar of lead or 2 drams hyposulphite of soda in a quart of water may be freely applied. If the skin is already abraded and scabby, smear thickly with vaseline for some hours, then wash with soapsuds and apply the above dressings. When the excoriations are indolent they may be painted with a solution of lunar caustic, 2 grains to 1 ounce of distilled water. Internally counteract costiveness and remove intestinal irritants by the same means as in eczema, and follow this with one-half ounce doses daily of hyposulphite of soda, and one-half ounce doses of gentian. Inveterate cases may often be benefited by a course of sulphur, bisulphite of soda, or arsenic. In all, the greatest care must be taken with regard to food, feeding, watering, cleanliness, and work. In wet and cold seasons predisposed animals should, so far as possible, be protected from wet, mud, snow, and melted snow—above all, from that which has been melted by salt.

BOILS, OR FURUNCLES.

These may appear on any part of the skin, but are especially common on the lower parts of the limbs, and on the shoulders and back where the skin is irritated by accumulated secretion and chafing with the harness. In other cases the cause is constitutional, or attended by unwholesome diet and overwork with loss of general health and condition. They also follow on weakening diseases, notably strangles in which irritants are retained in the system from overproduction of poisons and effete matters during fever, and imperfect elimination. There is also the presence of a pyogenic bacterium, by which the disease may be maintained and propagated.

While boils are pus-producing, they differ from simple pustule in affecting the deepest layers of the true skin, and even the superficial layers of the connective tissues beneath, and in the death and sloughing out of the central part of the inflamed mass (core). The depth of the hard, indurated, painful swelling, and the formation of this central mass or core, which is bathed in pus and slowly separated from surrounding parts, serve to distinguish the boil alike from the pustule, from the farcy bud, and from a superficial abscess.

Treatment.—To treat very painful boils a free incision with a lancet in two directions, followed by a dressing with one-half an ounce carbolic acid in a pint of water, bound on with cotton wool or lint, may cut them short. The more common course is to apply a warm poultice of linseed meal or wheat bran, and renew daily until the center of the boil softens, when it should be lanced and the core pressed out.

If the boil is smeared with a blistering ointment of Spanish flies and a poultice put over it, the formation of matter and separation of the core is often hastened. A mixture of sugar and soap laid on the boil is equally good. Cleanliness of the skin and the avoidance of all causes of irritation are important items, and a teaspoonful of bicarbonate of soda once or twice a day will sometimes assist in warding off a new crop.

NETTLERASH (SURFEIT, OR URTICARIA).

This is an eruption in the form of cutaneous nodules, in size from a hazelnut to a hickory nut, transient, with little disposition to the formation of either blister or pustule, and usually connected with shedding of the coat, sudden changes of weather, and unwholesomeness or sudden change in the food. It is most frequent in the spring and in young and vigorous animals (good feeders). The swelling embraces the entire thickness of the skin and terminates by an abrupt margin in place of shading off into surrounding parts. When the individual swellings run together there are formed extensive patches of thickened integument. These may appear on any part of the body, and may be general; the eyelids may be closed, the lips rendered immovable, or the nostrils so thickened that breathing becomes difficult and snuffling. It may be attended by constipation or diarrhea or by colicky pains. The eruption is sudden, the whole skin being sometimes covered in a few hours, and it may disappear with equal rapidity or persist for six or eight days.

Treatment.—This consists in clearing out the bowels by 5 drams Barbados aloes, or 1 pound Glauber's salts, and follow the operation of these by daily doses of one-half ounce powdered gentian and 1 ounce Glauber's salts. A weak solution of alum may be applied to the swellings.

SCALY SKIN DISEASE, OR PITYRIASIS.

This affection is characterized by an excessive production and detachment of dry scales from the surface of the skin. It is usually dependent on some fault in digestion and an imperfect secretion from the sebaceous glands, and is most common in old horses with spare habit of body. The horse may be given a laxative followed by dram doses of carbonate of potash, and the affected parts may be bathed with soft tepid water and smeared with an ointment made with vaseline and sulphur. In obstinate cases sulphur may be given daily in the food.

NERVOUS IRRITATION OF THE SKIN, OR PRURITUS.

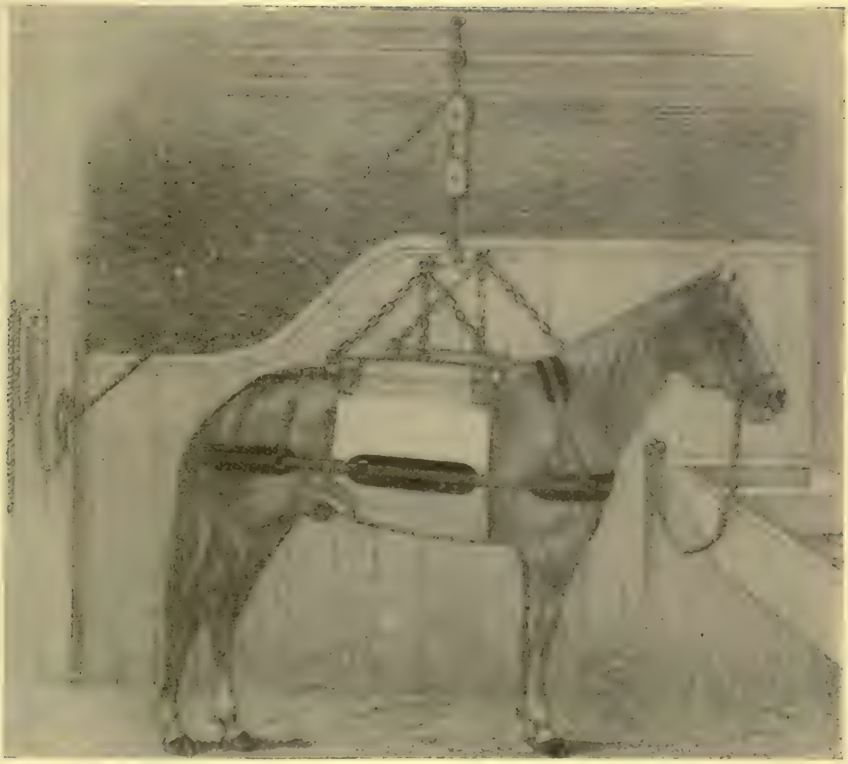
This is seen in horses fed to excess on grain and hay, kept in close stables, and worked irregularly. Though most common in summer, it is often severe in hot, close stables in winter. Pimples, vesicles, and abrasions may result, but as the itching is quite as severe on other parts of the skin, these may be the result of scratching merely. It is especially common and inveterate about the roots of the mane and tail.

Treatment.—Give a purgative (Glauber's salts, 1 pound), a restricted, laxative diet, and a wash of water slightly soured with oil of vitriol and rendered sweet by carbolic acid. If obstinate, give daily 1 ounce of sulphur and 20 grains nux vomica. If the acid lotion fails, 2 drams of carbonate of potash and 2 grains of cyanide of potassium in a quart of water will sometimes benefit. If due to pinworms in the rectum, the itching of the tail may be remedied by an occasional injection of a quart of water in which chips of quassia wood have been steeped for twelve hours.

HERPES.

This name has been applied to a disease in which there is an eruption of minute vesicles in circular groups or clusters, with little tendency to burst, but rather to dry up into fine scabs. If the vesicles break they exude a slight gummy discharge which concretes into a small, hard scab. It is apparently noncontagious and not appreciably connected with any disorder of internal organs. It sometimes accompanies or follows specific fevers, and is, on the whole, most frequent at the seasons of changing the coat—spring and autumn. It is seen on the lips and pastern, but may appear on any part of the body. The duration of the eruption is two weeks or even more, the tendency being to spontaneous recovery. The affected part is very irritable, causing a sensitiveness and a disposition to rub out of proportion to the extent of the eruption.

Treatment.—It may be treated by oxide of zinc ointment, and to relieve the irritation a solution of opium or belladonna in water,



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or of sugar of lead or oil of peppermint. A course of bitters (one-half an ounce Peruvian bark daily for a week) may be serviceable in bracing the system and producing an indisposition to the eruption.

SUMMER SORES FROM FILARIA IRRITANS.

The summer sores of horses (*Dermatitis granulosa,* boils) have been traced to the presence in the skin of another parasite, 3 millimeters in length and extremely attenuated (*Filaria irritans* Railliet) The sores may be seen as small as a millet seed, but more frequently the size of a pea, and may become an inch in diameter. They may appear on any point, but are especially obnoxious where the harness presses on the lower parts of the limbs. They cause intense and insupportable itching, and the victim rubs and bites the part until extensive raw surfaces are produced. Aside from such friction the sore is covered by a brownish-red, soft, pulpy material with cracks or furrows filled with serous pus. In the midst of the softened mass are small, firm, rounded granulations, fibrinous, and even caseated, and when the soft pultaceous material has been scraped off, the surface bears a resemblance to the fine yellow points of miliary tuberculosis in the lung. The worm or its débris is found in the center of such masses. These sores are very obstinate, resisting treatment for months in summer, and even after apparent recovery during the cold season they may appear anew the following summer. In bad cases the rubbing and biting may cause exposure of synovial sacs and tendons, and cause irremediable injury. Even in winter, however, when the diseased process seems arrested, there remain the hard, firm, resistant patches of the skin with points in which the diseased product has become softened like cheese.

The apparent subsidence of the disease in winter is attributed to the coldness and comparative bloodlessness of the skin, whereas in summer, with high temperature, active circulation, and rapid cell growth, inflammation is increased, itching follows, and from the animal rubbing the part the irritation is persistently increased. The hotter the climate the more troublesome the disease. The life history of the parasite is unknown, but it probably enters the system with the food or water.

Treatment.—Treatment consists in placing the animal in a cool place and showering with cold water. The parasite may be destroyed by rubbing the surface of the wound with iodoform and covering it with a layer of collodion, and repeating the applications every twenty-four hours for fifteen days, or until the sores heal up. Ether or chloroform may be used in place of iodoform, being poured on cotton wool and applied to the sore for two minutes before painting it with collodion.

CRACKED HEELS (SCRATCHES, OR CHAPS ON KNEE AND HOCK).

This usually sets in with swelling, heat, and tenderness of the hollow of the heel, with erections of the hairs and redness (in white skins), with stiffness and lameness, which may be extreme in irritable horses. Soon slight cracks appear transversely, and may gain in depth and width, and may even suppurate. More frequently they become covered at the edges or throughout by firm incrustations resulting from the drying of the liquids thrown out, and the skin becomes increasingly thick and rigid. A similar condition occurs behind the knee and in front of the hock (malanders and salanders), and may extend from these points to the hoof, virtually incasing that side of the limb in a permanent incrusting sheath.

Causes.—Besides a heavy lymphatic constitution, which predisposes to this affection, the causes are overfeeding on grain, unwholesome fodder, close, hot, dirty stables, constant contact with dung and urine and their emanations, working in deep, irritant mud; above all, in limestone districts, irritation by dry limestone or sandy dust in dry weather on dirt roads; also cold drafts, snow and freezing mud, washing the legs with caustic soap, wrapping the wet legs in thick woolen bandages which soak the skin and render it sensitive when exposed next day, clipping the heels, weak heart and circulation, natural or supervening on overwork, imperfect nourishment, impure air, lack of sunshine, chronic exhausting, or debilitating diseases, or functional or structural diseases of the heart, liver, or kidneys. These last induce dropsical swellings of the limbs (stocking), weaken the parts, and induce cracking. Finally the cicatrix of a pre-existing crack, weak, rigid, and unyielding, is liable to reopen under any severe exertion, hence rapid paces and heavy draft are active causes.

Treatment.—In treatment the first step is to ascertain and remove the cause whenever possible. If there is much local heat and inflammation, a laxative (5 drams aloes or 1 pound Glauber's salt) may be given, and for the pampered animal the grain should be reduced or replaced altogether by bran mashes, flaxseed, and other laxative, non-stimulating food. In the debilitated, on the other hand, nutritious food and bitter tonics may be given, and even a course of arsenic (5 grains arsenic with 1 dram bicarbonate of soda daily). When the legs swell, exercise on dry roads, hand rubbing, and evenly applied bandages are good, and mild astringents, like extract of witch-hazel, may be applied and the part subsequently rubbed dry and bandaged. If there is much heat but unbroken skin, a lotion of 2 drams sugar of lead to 1 quart of water may be applied on a thin bandage, covered in cold weather with a dry one. The same may be used after the cracks appear, or a solution of sulphurous acid 1 part, glycerin 1 part, and water 1 part, applied on cotton and well covered by a bandage. In case these should prove unsuitable to the particular case, the part may be smeared with vaseline 1 ounce, sugar of lead 1 dram, and carbolic acid 10 drops.

INFLAMMATION OF THE HEELS WITH SEBACEOUS SECRETION (GREASE, OR CANKER).

This is a specific affection of the heels of horses usually associated with the growth of a parasitic fungus, an offensive discharge from the numerous sebaceous glands, and, in bad cases, the formation of red, raw excrescences (grapes) from the surface. It is to be distinguished (1) from simple inflammation in which the special fetid discharge and the tendency to the formation of grapes are absent; (2) from horsepox, in which the abundant exudate forms a firm yellow incrustation around the roots of the hair, and is embedded at intervals in the pits formed by the individual pocks, and in which there is no vascular excrescence; (3) from foot scabies (mange), in which the presence of an acarus is distinctive; (4) from lymphangitis, in which the swelling appears suddenly extending around the entire limb as high as the hock, and on the inner side of the thigh along the line of the vein to the groin, and in which there is active fever, and (5) from erysipelas, in which there is active fever (wanting in grease), the implication of the deeper layers of the skin and of the parts beneath giving a boggy feeling to the parts, the absence of the fetid, greasy discharge, and finally a tendency to form pus loosely in the tissues without any limiting membrane, as in abscess. Another distinctive feature of grease is its tendency to implicate the skin which secretes the bulbs or heels of the horny frog and in the cleft of the frog, constituting the disease known as canker.

Causes.—The predisposing causes of grease are essentially the same as those of simple inflammation of the heel, so that the reader may consult the preceding article, and though a specific fungus and bacteria of different kinds are present, they tend mainly to aggravation of the disease, and are not proved to be essential factors in causation.

Symptoms.—The symptoms vary according to whether the disease comes on suddenly or more tardily. In the first case there is a sudden swelling of the skin in the heel, with heat, tenderness, itching, and stiffness, which is lessened during exercise. In the slower forms there is only seen a slight swelling after rest, and with little heat or inflammation for a week or more. Even at this early stage a slight serous oozing may be detected. As the swelling increases, extending up toward the hock or knees, the hairs stand erect, and are bedewed by moisture no longer clear and odorless, but grayish, milky, and fetid. The fetor of the discharge draws attention to the part whenever one enters the stable, and the swollen pastern and wet, matted hairs on the heel draw attention to the precise seat of the malady. If actively treated, the disease may not advance further, but if neglected the tense, tender skin cracks open, leaving open sores from which vascular bleeding growths grow up, constituting the grapes. The hair is shed, and the heel may appear but as one mass of rounded, red, angry excrescences which bleed on handling and are covered with the now repulsively fetid decomposing discharge. During this time there is little or no fever, the animal feeds well, and but for its local trouble it might continue at work. When the malady extends to the frog, there is a fetid discharge from its cleft or from the depressions at its sides, and this gradually extends to its whole surface and upon the adjacent parts of the sole. The horn meanwhile becomes soft, whitish, and fleshy in aspect, its constituent tubes being greatly enlarged and losing their natural cohesion; it grows rapidly above the level of the surrounding horn, and when pared is found to be penetrated to an unusual depth by the secreting papillæ, and that at intervals these have bulged out into a vascular fungous mass comparable to the grapes.

Treatment.—In treatment hygienic measures occupy a front rank, but are in themselves insufficient to establish a cure. All local and general conditions which favor the production and persistence of the disease must be guarded against. Above all, cleanliness and purity of the stable and air must be secured; also nourishing diet, regular exercise, and the avoidance of local irritants—septic, muddy, chilling, etc. At the outset benzoated oxide of zinc ointment may be used with advantage. A still better dressing is made with 1 ounce vaseline, 2 drams oxide of zinc, and 20 drops iodized phenol. If the surface is much swollen and tender, a flaxseed poultice may be applied over the surface of which has been poured some of the following lotion: Sugar of lead, one-half ounce; carbolic acid, 1 dram; water, 1 quart. All the astringents of the pharmacopœia have been employed with more or less advantage, and some particular one seems to suit particular cases or patients. To destroy the grapes, they may be rubbed daily with strong caustics (copperas, bluestone, lunar caustic), or each may be tied round its neck by a stout waxed thread, or, finally and more speedily, they may be cut off by a blacksmith's shovel heated to redness and applied with its sharp edge toward the neck of the excrescence, over a cold shovel held between it and the skin to protect the skin from the heat. The cold shovel must be kept cool by frequent dipping in water. After the removal of the grapes the astringent dressing must be persistently applied to the surface. When the frog is affected, it must be pared to the quick and dressed with dry caustic powders (quicklime, copperas, bluestone) or carbolic acid and subjected to pressure, the dressing being renewed every day at least.

CALLOSITIES.

These are simple thickening and induration of the cuticle by reason of continued pressure, notably in lying down on a hard surface. Being devoid of hair, they cause blemishes; hence smooth floors and good bedding should be secured as preventives.

WARTS.

These are essentially a morbid overgrowth of the superficial papillary layer of the skin and of the investing cuticular layer. They are mostly seen in young horses, about the lips, eyelids, cheeks, ears, beneath the belly, and on the sheath, but may develop anywhere. The smaller ones may be clipped off with scissors and the raw surface cauterized with bluestone. The larger may be sliced off with a sharp knife, or if with a narrow neck they may be twisted off and then cauterized. If very vascular they may be strangled by a wax thread or cord tied around their necks, at least three turns being made round and the ends being fixed by passing them beneath the last preceding turn of the cord, so that they can be tightened day by day as they slacken by shrinkage of the tissues. If the neck is too broad it may be transfixed several times with a double-threaded needle and then be tied in sections. Very broad warts that can not be treated in this way may be burned down to beneath the surface of the skin with a soldering bolt at a red heat, and any subsequent tendency to overgrowth kept down by bluestone.

BLACK PIGMENT TUMORS, OR MELANOSIS.

These are common in gray and in white horses on the naturally black parts of the skin at the root of the tail, around the anus, vulva, udder, sheath, eyelids, and lips. They are readily recognized by their inky-black color, which extends throughout the whole mass. They may appear as simple pealike masses, or as multiple tumors aggregating many pounds, especially around the tail. In the horse these are usually simple tumors, and may be removed with the knife. In exceptional cases they prove cancerous, as they usually are in man.

EPITHELIAL CANCER, OR EPITHELIOMA.

This sometimes occurs on the lips at the angle of the mouth and elsewhere in the horse. It begins as a small wartlike tumor, which grows slowly at first, but finally bursts open, ulcerates, and extends laterally and deeply in the skin and other tissues, destroying them as it advances (rodent ulcer). It is made up of a fibrous framework and numerous round, ovoid, or cylindrical cavities, lined with masses of epithelial cells, which may be squeezed out as a fetid caseous material. The most successful treatment is early and thorough removal with the knife.

VEGETABLE PARASITES OF THE SKIN.

PARASITE: *Trichophyton Tonsurans.* MALADY: *Tinea Tonsurans, or Circinate Ringworm.*—This is especially common in young horses coming into training and work, in low-conditioned colts in winter and spring after confinement indoors and during molting, in lymphatic rather than nervous subjects, and at the same time in several animals that have herded together. The disease is common to man, and among the domestic animals to horse, ox, goat, dog, cat, and in rare instances to sheep and swine. Hence it is common to find animals of different species and their attendants suffering at once, the diseases having been propagated from one to the other.

Symptoms.—In the horse the symptoms are the formation of a circular scurfy patch where the fungus has established itself, the hairs of the affected spot being erect, bristly, twisted, broken, or split up and dropping off. Later the spot first affected has become entirely bald, and a circular row of hairs around this are erect, bristly, broken, and split. These in turn are shed and a new row outside passes through the same process, so that the extension is made in more or less circular outline. The central bald spot, covered with a grayish scurf and surrounded by a circle of broken and split hairs, is characteristic. If the scurf and diseased hairs are treated with caustic potash solution and put under the microscope the natural cells of the cuticle and hair will be seen to have become transparent, while the groups of spherical cells and branching filaments of the fungus stand out prominently in the substance of both, dark and unchanged. The eruption usually appears on the back, loins, croup, chest, and head. It tends to spontaneous recovery in a month or two, leaving for a time a dappled coat from the spots of short, light-colored hair of the new growth.

The most effective way of reaching the parasite in the hair follicles is to extract the hairs individually, but in the horse the mere shaving of the affected part is usually enough. It may then be painted with tincture of iodine twice a day for two weeks. Germs about the stable may be covered up or destroyed by a whitewash of freshly burned quicklime, the harness, brushes, etc., may be washed with caustic soda, and then smeared with a solution of corrosive sublimate one-half dram and water 1 pint. The clothing may be boiled and dried.

PARASITE: *Achorion Schönleini.* MALADY: *Fabus, or Honeycomb Ringworm.*—Megnin and Goyau, who describe this in the horse, say that it loses its characteristic honeycomb or cup-shaped appearance and forms only a series of closely aggregated, dry, yellowish crusts the size of hemp seed on the trunk, shoulders, flanks, or thighs. They are accompanied by severe itching, especially at night. The cryptogam, formed of spherical cells with a few filaments only, grows in the hair follicles and on the cuticle, and thus a crust often forms around the root of a hair. Like the other cryptogams, their color, as seen under the microscope, is unaffected by acetic acid, alcohol, ether, or oil of turpentine, while the cells are turned bluish by iodine. For treatment, remove the hair and apply tincture of iodine or corrosive sublimate lotion, as advised under the last paragraph.

PARASITE: *Microsporon Furfur* MALADY: *Parasitic Pityriasis.*—This attacks the horse's head where the harness presses, and leads to dropping of the hair, leaving bald patches covered with a branlike scurf, without any eruption, heat, tenderness, swelling, or rigidity of the skin. A lotion of carbolic acid 1 dram and water 2½ ounces is usually applied to effect a cure.

ANIMAL PARASITES OF THE SKIN.

Acariasis, or Mange.—This affection is due to the irritation of the skin caused by the presence of nearly microscopic acarus, or mite. The disease varies, however, according to the species of acarus which infests the skin, so that we must treat of several different kinds of acariasis.

PARASITE: *Sarcoptes Scabiei Equi.* MALADY: *Sarcoptic Acariasis.*—This is the special *Sarcoptes* of the horse, but under favorable conditions it can be transmitted to ass and mule, and even to man, and may live indefinitely on the human skin. The mite is nearly microscopical, but may be detected with a magnifying lens among moving scurf taken from the infected skin. Like all *Sarcoptes*, it burrows little galleries in and beneath the scurf skin, where it hides and lays its eggs and where its young are hatched. It is therefore often difficult to find the parasite on the surface, unless the skin has been heated by a temporary exposure to the sun or in a warm room. Even then it may be needful to tie the scab on the human arm till a pricking is felt, when the acarus will be found in the center of a minute papule caused by its bite. Like other acari, this is wonderfully prolific, a new generation of fifteen individuals being possible every fifteen days, so that in three months the offspring of a single pair may produce generations aggregating 1,500,000 young. The *Sarcoptes* have less vitality than the nonburrowing acari, as they die in an hour when kept apart from the skin in dry air at a heat of 145° F. They live twelve to fourteen days apart from the skin in the damp air of a stable. On a piece of damp hide they lived till the twenty-fourth day, when they began to die, and all were dead on the twenty-eighth.

Symptoms.—The symptoms are an incessant, intolerable, and increasing itching of some part of the skin (head, mane, tail, back, etc.), the horse inclining himself toward the hand that scratches him, and moving his lips as if himself scratching. The hairs may be broken and rubbed off, but the part is never entirely bald, as in ringworm, and there may be papules or any kind of eruption or open sores from the energy of the scratching. Scabs of any thickness may form, but the special features are the intense itching and the discovery of the acarus.

Treatment.—Treatment consists in removal of the scabs by soapsuds, and, if necessary, a brush and the application of tobacco 1½ ounces and water 2 pints, prepared by boiling. This may be applied more than once, and should always be repeated after fifteen days, to destroy the new brood that may have been hatched in the interval. All harness and stable utensils should be similarly treated; blankets and rubbers may be boiled, and the stalls should be covered with a whitewash of quicklime, containing one-fourth pound of chloride of lime to the gallon.

PARASITE: *Psoroptes Equi.* MALADY: *Psoroptic Acariasis.*—This produces the most frequent mange in horses, and as the parasite only bites the surface and lives among the crusts under the shelter of the hair, it is very easily discovered. It reproduces itself with equal rapidity and causes similar symptoms to those produced by the *Sarcoptes.* The same treatment will suffice and is more promptly effectual. The purifying of the stable must be more thorough, as the *Psoroptes* will survive twenty to thirty days in the moist atmosphere of a stable, and may even revive after six or eight weeks when subjected to moist warmth. Infested pastures will therefore prove dangerous to horses for that length of time, and, with rubbing posts, etc., should not be used.

PARASITE: *Chorioptes Bovis.* MALADY: *Foot Mange.*—This acarus attacks the heels and lower parts of the legs, especially the hind ones, and may be present for years without extending upon the body. Like the *Psoroptes,* it lives on the surface, on the hairs, and among the scales. It gives rise to great itching, stamping, rubbing of the one leg with the other, and the formation of papules, wounds, ulcerous sores, and scabs. The intense itching will always suggest this parasite, and the discovery of the acarus will identify the disease. The treatment is the same as for the *Sarcoptes,* but may be confined to the legs and the parts with which they come in contact.

TICKS.

The wood ticks are familiar to inhabitants of uncultivated lands, and prove troublesome parasites to man and beast alike. The tick lives on bushes, and attaches itself to the mammal only to secure a feast of blood, for when gorged it drops off to sleep off its debauch on the soil. The tick produces great irritation by boring into the skin with its armed proboscis. If pulled out, the head and thorax are often left in the skin. They may be covered with oil to shut out the air from their breathing pores, or by touching them with a hot penknife they will be impelled to let go their hold.

GRUBS IN SKIN.

Parasite: *Hypoderma Lineata.* Malady: *Larvæ (grubs) under the skin.*—The larvæ of the fly (probably *Hypoderma lineata,* whose larvæ in the skin of cattle are commonly known as "warbles") are occasionally found in little sacs beneath the skin of horses. The mature larva escapes in early summer and develops into a fly. In districts where they exist the grubs should be pressed out of the skin in the course of the winter and destroyed.

LARVAE (GRUBS) ON THE SKIN, OR FLYBLOW.

The following flies, among others, deposit their eggs on open sores or on wet, filthy parts of the skin, where their larvæ or grubs give rise to serious trouble: *Lucilia cæsar* (bluebottle), *Lucilia hominivorax* (screwworm fly), *Musca vomitoria* (meat fly), and *Sarcophaga carnaria* (flesh fly). To prevent their attacks, filthy hair should be removed and wounds kept clean and rendered antiseptic by a lotion of carbolic acid 1 part, water 50 parts, or by a mixture of 1 ounce oil of tar in 20 ounces sweet oil, or by some other antiseptic. If the grubs are already present they should be picked off and one of these dressings freely applied.

FLIES.

A number of flies attack horses and suck their blood, producing great annoyance, and in some instances death. These insects not only suck the blood, but also often instill an acid poison into the skin, and in exceptional cases transfer infectious germs from animal to animal by inoculation.

Various devices are resorted to to prevent the attacks, as to sponge the skin with a decoction of walnut or elder leaves, of tobacco, to dust with Persian insect powder, to keep a light blanket or fly net on the horse, to close doors and windows with fine screens and destroy by pyrethrum any flies that have gained admission, to remove all manure heaps that would prove breeding places for flies, to keep the stalls clean, deodorize by gypsum, and to spread in them trays of dry chloride of lime. For the poisoned bites apply ammonia, or a solution of 1 part of carbolic acid in 20 parts of sweet oil or glycerin, or one-fourth ounce bicarbonate of soda and 1 dram of carbolic acid in a quart of water may be used.

STINGS OF BEES, WASPS, AND HORNETS.

These are much more irritating than the bites of flies, partly because the barbed sting is left in the wound, and partly because of the amount and quality of the venom. When a swarm attacks an animal the result may prove fatal. Treatment consists in the application of wet clay, or of a lotion of soda or ammonia, or of carbolic acid, or permanganate of potash, 2 grains to the ounce, or of sugar of lead 2 drams, laudanum 1 ounce, and water 1 pint. The embedded stings should be extracted with fine forceps or even with the finger nails.

FLEA, OR PULEX.

The flea of man and those of the dog and cat, when numerous, will bite the horse and give rise to rounded swellings on the skin. To dispose of them it is needful to clear the surroundings of the grublike larvæ as well as to treat the victim. The soil may be sprinkled with quicklime, carbolic acid, coal tar, or petroleum; the stalls may be deluged with boiling water and afterwards painted with oil of turpentine and littered with fresh pine sawdust, and all blankets should be boiled. The skin may be sponged with a solution of 1 part of carbolic acid in 50 parts of water. Dogs, cats, and pigs should be dressed with the same lotion, or, better, removed from the vicinity of the stable. The chigoe of the Gulf coast is still more injurious, because it burrows under the surface and deposits its eggs to be hatched out slowly with much irritation. The tumor formed by it should be laid open and the parasite extracted. If it bursts so that its eggs escape into the wound, they may be destroyed by introducing a wire at a red heat.

LICE, OR PEDICULI.

Two kinds of lice attack the horse, one of which is furnished with narrow head and a proboscis for perforating the skin and sucking the blood, and the other—the broad-headed kind—with strong mandibles, by which it bites the skin only. Of the bloodsuckers, one is common to horse and ass and another to horse and ox, while of the nonsucking lice one species attacks horse and ox and a second ox and ass. The poor condition, itching, and loss of hair should lead to suspicion, and a close examination will detect the lice. They may be destroyed by rubbing the victim with sulphur ointment, or with sulphuret of potassium 4 ounces, water 1 gallon, or with tar water, or the skin may be sponged with benzine. The application should be repeated a week later to destroy all lice hatched from the nits in the interval. Buildings, clothes, etc., should be treated as for fleas.

TARANTULA AND SCORPION.

The bite of the first and the sting of the second are poisonous, and may be treated like other insect venom, by carbolated glycerin, or a strong solution of ammonia, or permanganate of potash.

SNAKE BITES.

These are marked by the double incision caused by the two fangs, by the excessive doughy (dark red) swelling around the wounds, and in bad cases by the general symptoms of giddiness, weakness, and prostration. They are best treated by enormous doses of alcohol, whisky, or brandy, or by aqua ammonia very largely diluted in water, the object being to sustain life until the poison shall have spent its power. As local treatment, if the wound is in a limb, the latter may have a handkerchief or cord tied around it above the injury and drawn tight by a stick twisted into it. In this way absorption may be checked until the poison can be destroyed by the application of a hot iron or a piece of nitrate of silver or other caustic. A poultice of tobacco leaves is a favorite remedy, and may be used to soothe the sore after cauterization.—(Spl. Rpt. Horse, Dept. Agr. 1911.)

DISEASES OF THE GENERATIVE ORGANS.

CONGESTION AND INFLAMMATION OF THE TESTICLES, OR ORCHITIS.

In the prime of life, in vigorous health, and on stimulating food, stallions are subject to congestion of the testicles, which become swollen, hot, and tender, but without any active inflammation. A reduction of the grain in the feed, the administration of 1 or 2 ounces of Glauber's salts daily in the food, and the bathing of the affected organs daily with tepid water or alum water will usually restore them to a healthy condition.

When the factors producing congestion are extraordinarily potent, when there has been frequent copulation and heavy grain feeding, when the weather is warm and the animal has had little exercise, and when the proximity of other horses or mares excites the generative instinct without gratification, this congestion may grow to actual inflammation. Among the other causes of orchitis are blows and penetrating wounds implicating the testicles, abrasions of the scrotum by a chain or rope passing inside the thigh, contusions and frictions on the gland under rapid paces or heavy draft, compression of the blood vessels of the spermatic cord by the inguinal ring under the same circumstances, and finally, sympathetic disturbance in cases of disease of the kidneys, bladder, or urethra. Stimulants of the generative functions, like cantharides, and damiana, may also be accessory causes of congestion and inflammation. Finally, certain specific diseases like maladie du coit, glanders, and tuberculosis, localized in the testicles, will cause inflammation.

Symptoms.—Apart from actual wounds on the parts, the symptoms of orchitis are swelling, heat, and tenderness of the testicles, straddling with the hind legs alike in standing and walking, stiffness and dragging of the hind limbs or of the limb on the affected side, arching of the loins, abdominal pain, manifested by glancing back at the flank, with more or less fever, elevated body temperature, accelerated pulse and breathing, and dullness. In bad cases the scanty urine may be reddish and the swelling may extend to the skin and envelopes of the testicles, which may become thickened and doughy, pitting on pressure. The swelling may be so great along the upper border of the testicle as to suggest the presence of a second stone. Even in the more violent attacks the intense suffering abates somewhat on the second or third day. If it lasts longer it is likely to give rise to the formation of matter. In exceptional cases the testicle is struck with gangrene, or death. Improvement may go on slowly to complete recovery, or the malady may subside into a subacute and chronic form with induration. Matter may be recognized by the presence of a soft spot, where pressure with two fingers will detect fluctuation from one to the other. When there is liquid exudation into the scrotum, or sac, fluctuation may also be felt, but the liquid can be made out to be around the testicle and can be pressed up into the abdomen. When abscess occurs in the cord the matter may escape into the scrotal sac and cavity of the abdomen.

Treatment.—This consists in perfect rest and quietude, the administration of a purgative (1 to 1½ pounds Glauber's salts), and the local application of an astringent lotion (acetate of lead 2 drams, extract of belladonna 2 drams, and water 1 quart) upon soft rags or cotton wool, kept in contact with the part by a suspensory bandage. This bandage, of great value for support, may be made nearly triangular and tied to a girth around the loins and to the upper part of the same surcingle by two bands carried backward and upward between the thighs. When abscess is threatened its formation may be favored by warm fomentations or poultices, and on the occurrence of fluctuation the knife may be employed to give free escape to the pus. The resulting cavity may be injected daily with a weak carbolic acid lotion. The same agents may be used on a gland threatened with gangrene, but its prompt removal by castration is to be preferred, antiseptics being applied freely to the resulting cavity.

SARCOCELE.

This is an enlarged and indurated condition of the gland, resulting from chronic inflammation, though it is often associated with a specific deposit, like glanders. In this condition the natural structure of the gland has given place to embryonal tissue (small round cells, with a few fibrous bundles), and its restoration to health is very improbable. Apart from active inflammation, it may increase very slowly. The diseased testicle is enlarged, firm, nonelastic, and comparatively insensible. The skin of the scrotum is tense, and it may be edematous, as are the deeper envelopes and spermatic cords. If liquid is present in the sac, the symptoms are masked somewhat. As it increases it causes awkward straddling, dragging movement of the hind limbs, or lameness on the affected side. The spermatic cord often increases at the same time with the testicle, and the inguinal ring being thereby stretched and enlarged, a portion of intestine may escape into the sac, complicating the disease with hernia. The only rational and effective treatment is castration, and even this may not succeed when the disease is specific (glanders, tuberculosis).

HYDROCELE, OR DROPSY OF THE SCROTUM.

This may be merely an accompaniment of dropsy of the abdomen, the cavity of which is continuous with that of the scrotum in horses. It may be the result, however, of local disease in the testicle, spermatic cord, or walls of the sac.

Symptoms.—The symptoms are enlargement of the scrotum, and fluctuation under the fingers, the testicle being recognized as floating in water. By pressure the liquid is forced, in a slow stream and with a perceptible thrill, into the abdomen. Sometimes the cord or the scrotum is thickened and pits on pressure.

Treatment may be the same as for ascites, yet when the effusion has resulted from inflammation of the testicle or cord, astringent applications (chalk and vinegar) may be applied to these. Then, if the liquid is not reabsorbed under diuretics and tonics, it may be drawn off through the nozzle of a hypodermic syringe which has been first passed through carbolic acid. In geldings it is best to dissect out the sacs.

VARICOCELE.

This is an enlargement of the venous network of the spermatic cord, and gives rise to general thickening of the cord from the testicle up to the ring. The same astringent dressings may be tried as in hydrocele, and, this failing, castration may be resorted to.

WARTS ON THE PENIS.

These are best removed by seizing them between the thumb and forefinger and twisting them off. Or they may be cut off with scissors and the roots cauterized with nitrate of silver.

EXTRAVASATION OF BLOOD IN THE PENIS.

As the result of kicks, blows, or of forcible striking of the yard on the thighs of the mare which it has failed to enter, the penis may become the seat of effusion of blood from one or more ruptured blood vessels. This gives rise to a more or less extensive swelling on one or more sides, followed by some heat and inflammation, and on recovery a serious curving of the organ. The treatment in the early stages may be the application of lotions, of alum, or other astringents, to limit the amount of effusion and favor absorption. The penis should be suspended in a sling.

PARALYSIS OF THE PENIS.

This results from blows and other injuries, and also in some cases from too frequent and exhausting service. The yard hangs from the sheath, flaccid, pendulous, and often cold. The passage of urine occurs with lessened force, and especially without the final jets. In cases of local injury the inflammation should first be subdued by astringent and emollient lotions, and in all cases the system should be invigorated by nourishing diet, while 30-grain doses of nux vomica are given twice a day. Finally, a weak current of electricity sent through the penis from just beneath the anus to the free portion of the yard, continued for ten or fifteen minutes and repeated daily, may prove successful.

SELF-ABUSE, OR MASTURBATION.

Some stallions acquire this vicious habit, stimulating the sexual instinct to the discharge of semen by rubbing the penis against the belly or between the fore limbs. The only remedy is a mechanical one, the fixing of a net under the penis in such fashion as will prevent the extension of the penis, or so prick the organ as to compel the animal to desist through pain.

CASTRATION OF STALLIONS.

This is usually done at one year old, but may be accomplished at a few weeks old at the expense of an imperfect development of the fore parts. The simplicity and safety of the operation are greatest in the young. The delay till two, three, or four years old will secure a better development and carriage of the fore parts. The essential part of castration is the safe removal or destruction of the testicle and the arrest or prevention of bleeding from the spermatic artery found in the anterior part of the cord. Into the many methods of accomplishing this limited space forbids us to enter here, so that the method most commonly adopted, castration by clamps, will alone be noticed. The animal having been thrown on his left side, and the right hind foot drawn up on the shoulder, the exposed scrotum, penis, and sheath are washed with soap and water, any concretion of sebum being carefully removed from the bilocular cavity in the end of the penis. The left spermatic cord, just above the testicle, is now seized in the left hand, so as to render the skin tense over the stone, and the right hand, armed with the knife, makes an incision from before backward, about three-fourths of an inch from and parallel to the median line between the thighs, deep enough to expose the testicle and long enough to allow that organ to start out through the skin. At the moment of making this incision the left hand must grasp the cord very firmly, otherwise the sudden retraction of the testicle by the cremaster muscle may draw it out of the hand and upwards through the canal and even into the abdomen. In a few seconds, when the struggle and retraction have ceased, the knife is inserted through the cord, between its anterior and posterior portions, and the latter, the one which the muscle retracts, is cut completely through. The testicle will now hang limp, and there is no longer any tendency to retraction. It should be pulled down until it will no longer hang loose below the wound and the clamps applied around the still attached portion of the cord, close up to the skin. The clamps, which may be made of any tough wood, are grooved along the center of the surfaces opposed to each other, thereby fulfilling two important indications—(*a*) enabling the clamps to hold more securely and (*b*) providing for the application of an antiseptic to the cord. For this purpose a dram of sulphate of copper may be mixed with an ounce of vaseline and pressed into the groove in the face of each clamp. In applying the clamp over the cord it should be drawn so close with pincers as to press out all blood from the compressed cord and destroy its vitality, and the cord applied upon the compressing clamp should be so hard-twined that it will not stretch later and slacken the hold. When the clamp has been fixed the testicle is cut off one-half to 1 inch below it, and the clamp may be left thus for twenty-four hours; then, by cutting the cord around one end of the clamp, the latter may be opened and the stump liberated without any danger of bleeding. Should the stump hang out of the wound it should be pushed inside with the finger and left there. The wound should begin to discharge white matter on the second day, in hot weather or the third in cold, and from that time a good recovery may be expected.

CONDITIONS FAVORABLE TO SUCCESSFUL CASTRATION.

The young horse suffers less from castration than the old, and very rarely perishes. Good health in the subject is all important. Castration should never be attempted during the prevalence of strangles, influenza, catarrhal fever, contagious pleurisy, bronchitis, pneumonia, purpura hemorrhagica, or other specific disease, nor on subjects that have been kept in close, ill ventilated, filthy buildings, where the system is liable to have been charged with bacteria or other products. Warm weather is to be preferred to cold, but the fly time should be avoided or the flies kept at a distance by the application of a watery solution of tar, carbolic acid, or camphor to the wound.

CASTRATION OF CRYPTORCHIDS (RIDGLINGS).

This is the removal of a testicle or testicles that have failed to descend into the scrotum, but have been detained in the inguinal canal or inside the abdomen. The manipulation requires an accurate anatomical knowledge of the parts, and special skill, experience, and manual dexterity, and can not be made clear to the unprofessional mind in a short notice. It consists, however, in the discovery and removal of the missing gland by exploring through the natural channel, or, in case it is absent, through the inguinal ring or through an artificial opening made in front and above that channel between the abdominal muscles and the strong fascia on the inner side of the thigh. Whatever method is used, the skin, hands, and instruments should be rendered aseptic with a solution of mercuric chloride 1 part, water 2,000 parts (a carbolic acid lotion for the instruments), and the spermatic cord is best torn through by the écraseur. In many such cases, too, it is desirable to sew up the external wound and keep the animal still, to favor healing of the wound by adhesion.

PAIN AFTER CASTRATION.

Some horses are pained and very restless for some hours after castration, and this may extend to cramps of the bowels and violent colic. This is best kept in check by carefully rubbing the patient dry when he rises from the operation, and then leading him in hand for some time. If the pain still persists a dose of laudanum (1 ounce for an adult) may be given.

BLEEDING AFTER CASTRATION.

Bleeding from the wound in the scrotum and from the little artery in the posterior portion of the spermatic cord always occurs, and in warm weather may appear to be quite free. It scarcely ever lasts, however, over fifteen minutes, and is easily checked by dashing cold water against the part.

Bleeding from the spermatic artery in the anterior part of the cord may be dangerous when due precaution has not been taken to prevent it. In such case the stump of the cord should be sought for and the artery twisted with artery forceps or tied with a silk thread. If the stump can not be found, pledgets of tow wet with tincture of muriate of iron may be stuffed into the canal to favor the formation of clot and the closure of the artery.

STRANGULATED SPERMATIC CORD.

If in castration the cord is left too long, so as to hang out of the wound, the skin wound in contracting grasps and strangles it, preventing the free return of blood and causing a steadily advancing swelling. In addition the cord becomes adherent to the lips of the wound in the skin, whence it drives an increased supply of blood, and is thereby stimulated to more rapid swelling. The subject walks stiffly, with straddling gait, loses appetite, and has a rapid pulse and high fever. Examination of the wound discloses the partial closure of the skin wound and the protrusion from its lips of the end of the cord, red, tense, and varying in size from a hazelnut upward. If there is no material swelling and little protrusion, the wound may be enlarged with the knife and the end of the cord broken loose from any connection with the skin and pushed up inside. If the swelling is larger, the mass constitutes a tumor and must be removed.

SWELLING OF THE SHEATH, PENIS, AND ABDOMEN.

This occurs in certain unhealthy states of the system, in unhealthy seasons, as the result of operating without cleansing the sheath and penis, or of keeping the subject in a filthy, impure building, as the result of infecting the wound by hands or instruments bearing septic bacteria, or as the result of premature closure of the wound, and imprisonment of matter.

Pure air and cleanliness of groin and wound are to be secured. Antiseptics, like the mercuric chloride lotion (1 part to 2,000) are to be applied to the parts; the wound, if closed, is to be opened anew, any accumulated matter or blood washed out, and the antiseptic liquid freely applied. The most tense or dependent parts of the swelling in sheath or penis, or beneath the belly, should be pricked at intervals of 3 or 4 inches, and to a depth of half an inch, and antiseptics freely used to the surface. Fomentations with warm water may also be used to favor oozing from the incisions and to encourage the formation of white matter in the original wounds, which must not be allowed to close again at once. A free, creamlike discharge implies a healthy action in the sore, and is the precursor of recovery.

TUMORS ON THE SPERMATIC CORD.

These are due to rough handling or dragging upon the cord in castration, to strangulation of unduly long cords in the external wound, to adhesion of the end of the cord to the skin, to inflammation of the cord succeeding exposure to cold or wet, or to the presence of infection. These tumors give rise to a stiff, straddling gait, and may be felt as hard masses in the groin connected above with the cord. They may continue to grow slowly for many years until they reach a weight of 15 or 20 pounds, and contract adhesions to all surrounding parts. If disconnected from the skin and inguinal canal they may be removed in the same manner as the testicle, while if larger and firmly adherent to the skin and surrounding parts generally, they must be carefully dissected from the parts, the arteries being tied as they are reached and the cord finally torn through with an écraseur. When the cord has become swollen and indurated up into the abdomen such removal is impossible, though a partial destruction of the mass may still be attempted by passing white-hot pointed irons upward toward the inguinal ring in the center of the thickened and indurated cord.

CASTRATION OF THE MARE.

Castration is a much more dangerous operation in the mare than in the females of other domesticated quadrupeds and should never be resorted to except in animals that become unmanageable on the recurrence of heat and that will not breed or that are utterly unsuited to breeding. Formerly the operation was extensively practiced in Europe, the incision being made through the flank, and a large proportion of the subjects perished. By operating through the vagina the risk can be largely obviated, as the danger of unhealthy inflammation in the wound is greatly lessened. The animal should be fixed in a trevis, with each foot fixed to a post and a sling placed under the body, or it may be thrown and put under chloroform. The manual operation demands special professional knowledge and skill, but it consists essentially in making an opening through the roof of the vagina just above the neck of the womb, then following with the hand each horn of the womb until the ovary on that side is reached and grasped between the lips of forceps and twisted off. It might be torn off by an écraseur especially constructed for the purpose. The straining that follows the operation may be checked by ounce doses of laudanum, and any risk of protrusion of the bowels may be obviated by applying the truss advised to prevent eversion of the womb. To further prevent the pressure of the abdominal contents against the vaginal wound the mare should be tied short and high for twenty-four or forty-eight hours, after which I have found it best to remove the truss and allow the privilege of lying down. Another important point is to give bran mashes and other laxative diet only, and in moderate quantity, for a fortnight, and to unload the rectum by copious injections of warm water in case it should threaten to become impacted.

STERILITY.

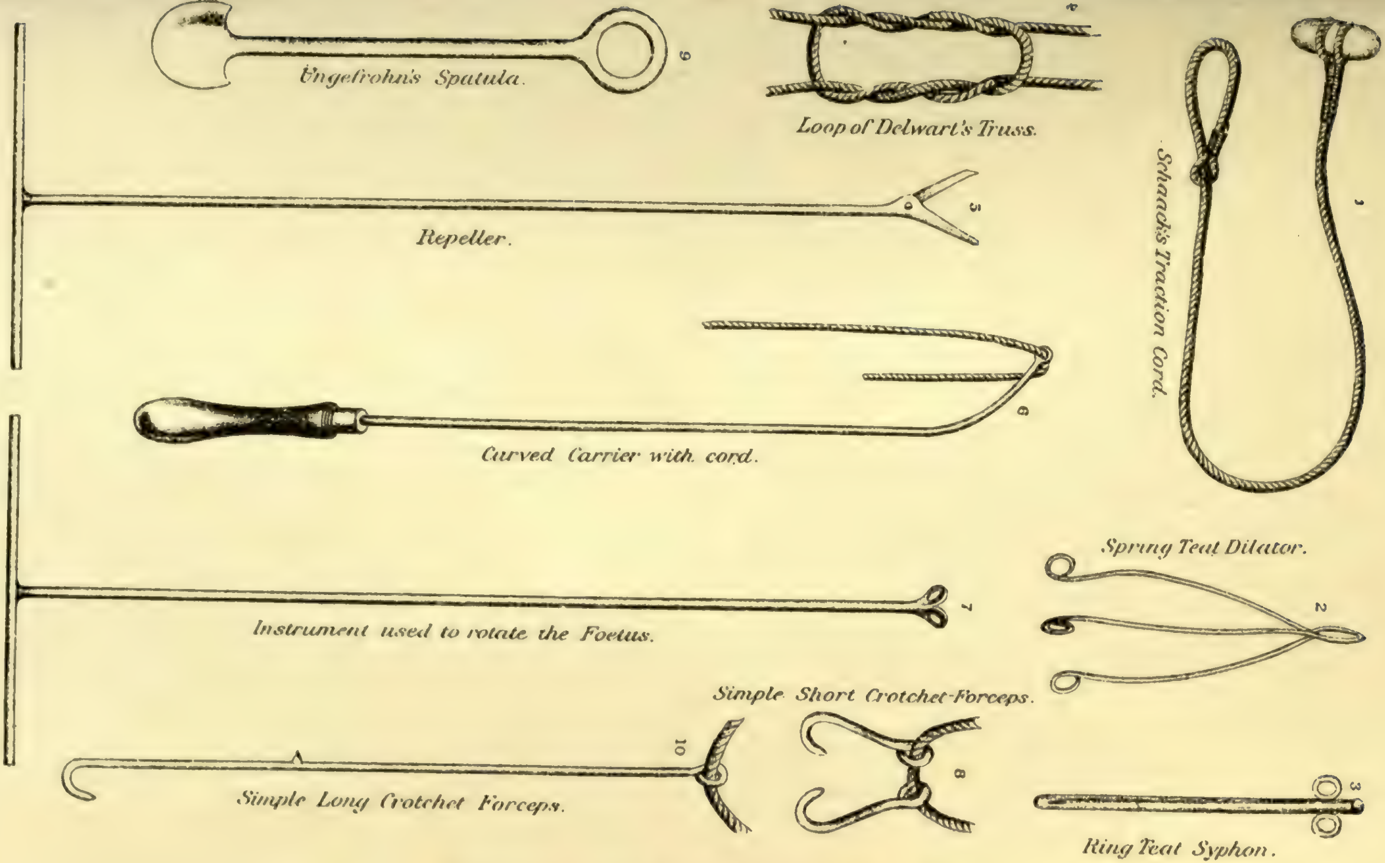
Sterility may be in the male or in the female. If due to the stallion, then all the mares put to him remain barren; if due to the mare, she alone fails to conceive.

INDICATIONS OF PREGNANCY.

As the mere fact of service by the stallion does not insure pregnancy, it is important that the result should be determined, to save the mare from unnecessary and dangerous work or medication when actually in foal and to obviate wasteful and needless precautions when she is not.

The cessation and nonrecurrence of the symptoms of heat (horsing) are most significant though not an infallible sign of conception. If the sexual excitement speedily subsides and the mare persistently refuses the stallion for a month, she is probably pregnant. In very exceptional cases a mare will accept a second or third service after weeks or months, though pregnant, and some mares will refuse the horse persistently, though conception has not taken place, and this in spite of warm weather, good condition of the mare, and liberal feeding. The recurrence of heat in the pregnant mare is most likely to take place in hot weather. If heat merely persists an undue length of time after service, or if it reappears shortly after, in warm weather and in a comparatively idle mare, on good feeding, it is less significant, while the persistent absence of heat under such conditions may be usually accepted as proof of conception.

An unwonted gentleness and docility on the part of a previously irritable or vicious mare, and supervening on service, is an excellent indication of pregnancy, the generative instinct which caused the excitement having been satisfied. An increase of fat, with softness



INSTRUMENTS USED IN DIFFICULT LABOR. B. A. I.

and flabbiness of muscle, a loss of energy, indisposition for active work, a manifestation of laziness, indeed, and of fatigue early and easily induced, when preceded by service, will usually imply conception.

Enlargement of the abdomen, especially in its lower third, with slight falling in beneath the loins and hollowness of the back are significant symptoms, though they may be entirely absent. Swelling and firmness of the udder, with the smoothing out of its wrinkles, is a suggestive sign, even though it appears only at intervals during gestation. A steady increase in weight (1½ pounds daily) about the fourth or fifth month is a useful indication of pregnancy. So is a swollen and red or bluish-red appearance of the vaginal mucous membrane.

From the seventh or eighth month onward the foal may be felt by the hand (palm or knuckles) pressed into the abdomen in front of the left stifle. The sudden push displaces the foal toward the opposite side of the womb, and as it floats back its hard body is felt to strike against the hand. If the pressure is maintained the movements of the live foal are felt, and especially in the morning and after a drink of cold water or during feeding. A drink of cold water will often stimulate the fetus to movements that may be seen by the eye, but an excess of iced water may prove injurious, even to the causing of abortion. Cold water dashed on the belly has a similar effect on the fetus and equally endangers abortion.

Examination of the uterus with the oiled hand introduced into the rectum is still more satisfactory, and if cautiously conducted no more dangerous. The rectum must be first emptied and then the hand carried forward until it reaches the front edge of the pelvic bones below, and pressed downward to ascertain the size and outline of the womb. In the unimpregnated state the vagina and womb can be felt as a single rounded tube, dividing in front to two smaller tubes. In the pregnant mare not only the body of the womb is enlarged, but still more so one of the horns (right or left), and on compression the latter is found to contain a hard, nodular body, floating in a liquid, which in the latter half of gestation may be stimulated by gentle pressure to manifest spontaneous movements. By this method the presence of the fetus may be determined as early as the third month. If the complete natural outline of the virgin womb can not be made out, careful examination should always be made on the right and left side for the enlarged horn and its living contents. Should there still be difficulty the mare should be placed on an inclined plane, with her hind parts lowest, and two assistants, standing on opposite sides of the body, should raise the lower part of the abdomen by a sheet passed beneath it. Finally the ear applied on the wall of the abdomen in front of the stifle may detect the beating of the fetal heart (one hundred and twenty-five per minute) and a blowing sound, much less rapid and corresponding to the number of the pulse of the dam. It is heard most satisfactorily after the sixth or eighth month and in the absence of active rumbling of the bowels of the dam.

DURATION OF PREGNANCY.

Mares usually go about eleven months with young, though first pregnancies often last a year. Foals have lived when born at the three hundredth day, so with others carried till the four hundredth day. With the longer pregnancies there is a greater probability of male offspring.

HYGIENE OF THE PREGNANT MARE.

The pregnant mare should not be exposed to teasing by a young and ardent stallion, nor should she be overworked or fatigued, particularly under the saddle or on uneven ground. Yet exercise is beneficial to both mother and offspring, and in the absence of moderate work the breeding mare should be kept in a lot where she can take exercise at will.

The food should be liberal, but not fattening—oats, bran, sound hay, and other foods rich in the principles which form flesh and bone being especially indicated. All ailments that tend to indigestion are to be especially avoided. Thus rank, aqueous, rapidly growing grasses and other green food, partially ripe rye grass, millet, hungarian grass, vetches, peas, beans, or maize are objectionable, as is overripe, fibrous, innutritious hay, or that which has been injured and rendered musty by wet, or that which is infested with smut or ergot. Food that tends to costiveness should be avoided. Water given often, and at a temperature considerably above freezing, will avoid the dangers of indigestion and abortion which result from taking too much ice-cold water at one time. Very cold or frozen food is objectionable in the same sense. Severe surgical operations and medicines that act violently on the womb, bowels, or kidneys are to be avoided as being liable to cause abortion. Constipation should be corrected, if possible, by bran mashes, carrots, or beets, seconded by exercise, and if a medicinal laxative is required it should be olive oil or other equally bland agent.

The stall of the pregnant mare should not be too narrow, so as to cramp her when lying down or to entail violent effort in getting up, and it should not slope too much from the front backward, as this throws the weight of the uterus back on the pelvis and endangers abortion. Violent mental impressions are to be avoided, for though the majority of mares are not affected thereby, yet a certain number are so profoundly impressed that peculiarities and distortions are entailed on the offspring. Hence, there is wisdom shown in banishing particolored or objectionably tinted animals, and those that show deformities or faulty conformation. Hence, too, the importance of preventing prolonged acute suffering by the pregnant mare, as certain troubles of the eyes, feet, and joints in the foals have been clearly traced to the concentration of the mother's mind on corresponding injured organs in herself. Sire and dam alike tend to reproduce their individual defects which predispose to disease, but the dam is far more likely to perpetuate the evil in her progeny which was carried while she was individually enduring severe suffering caused by such defects. Hence, an active bone spavin or ringbone, causing lameness, is more objectionable than that in which the inflammation and lameness have both passed, and an active ophthalmia is more to be feared than even an old cataract. For this reason all active diseases in the breeding mare should be soothed and abated at as early a moment as possible.

DROPSY OF THE WOMB.

This appears as a result of some disease of the walls of the womb, but has been frequently observed as the result of infection after sexual congress, and has, therefore, been confounded with pregnancy. The symptoms are those of pregnancy, but without any movements of the fetus and without the detection of any solid body in the womb when examined with the oiled hand in the rectum. At the end of four or eight months there are signs of parturition or of frequent straining to pass urine, and after a time the liquid is discharged clear and watery, or muddy, thick, and fetid. The hand introduced into the womb can detect neither fetus nor fetal membrane. If the neck of the womb closes, the liquid may accumulate a second time, or even a third, if no means are taken to disinfect it or to correct the tendency. The best resort is to remove any diseased product that may be found attached to the walls of the womb, and to inject it daily with a warm solution of carbolic acid 2 drams, chloride of zinc one-half dram, water 1 quart. A course of bitter tonics (gentian 2 drams, sulphate of iron 2 drams, daily) should be given, and a nutritious, easily digested, and slightly laxative diet allowed.

DROPSY OF THE AMNION.

This differs from simple dropsy of the womb in that the fluid collects in the inner of the two water bags (that in which the foal floats) and not in the otherwise void cavity of the womb. This affection can occur only in the pregnant animal, while dropsy of the womb occurs in the unimpregnated. The blood of the pregnant mare contains an excess of water and a smaller proportion of albumen and red globules, and when this is still further aggravated by poor feeding and other unhygienic conditions there is developed the tendency to liquid transudation from the vessels and dropsy. As the watery condition of the blood increases with advancing pregnancy, so dropsy of the amnion is a disease of the last four or five months of gestation. The abdomen is large and pendulous, and the swelling fluctuates under pressure, though the solid body of the fetus can still be felt to strike against the hand pressed into the swelling. If the hand is introduced into the vagina, the womb is found to be tense and round, with the projecting rounded neck effaced, while the hand in the rectum will detect the rounded swollen mass of the womb so firm and tense that the body of the fetus can not be felt within it. The mare moves weakly and unsteadily on her limbs, having difficulty in supporting the great weight, and in bad cases there may be loss of appetite, stocking of the hind limbs, difficult breathing, and colicky pains. The tension may lead to abortion, or a slow, laborious parturition may occur at the usual time.

Treatment.—This consists in relieving the tension and accumulation by puncturing the fetal membrane with a canula and trocar introduced through the neck of the womb and the withdrawal of the trocar so as to leave the canula in situ. Or the membranes may be punctured with the finger and the excess of liquid allowed to escape. This may bring on abortion, or the wound may close and gestation continue to the full term. A course of tonics (gentian root 2 drams, sulphate of iron 2 drams, daily) will do much to fortify the system and counteract further excessive effusion.

DROPSY OF THE LIMBS, PERINEUM, AND ABDOMEN.

The disposition to dropsy often shows itself in the hind and even in the fore limbs, around and beneath the vulva and beneath the abdomen and chest. The affected parts are swollen and pit on pressure, but are not especially tender, and subside more or less perfectly under exercise, hand rubbing, and bandages. In obstinate cases rubbing with the following liniment may be resorted to: Compound tincture of iodine, 2 ounces; tannic acid, one half dram; water, 10 ounces. It does not last over a day or two after parturition.

CRAMPS OF THE HIND LIMBS.

The pressure of the distended womb on the nerves and blood vessels of the pelvis, besides conducing to dropsy, occasionally causes cramps of the hind limbs. The limb is raised without flexing the joints, the front of the hoof being directed toward the ground, or, the spasms occurring intermittently, the foot is kicked violently against the ground several times in rapid succession. The muscles are felt to be firm and rigid. The cramp may be promptly relieved by active rubbing, or by walking the animal about, and it does not reappear after parturition.

PROLONGED RETENTION OF THE FETUS (FOAL).

In the mare, though far less frequently than in the cow, parturition may not be completed at term, and the foal may continue to be carried in the womb for a number of months, to the serious or even fatal injury of the mare.

Cause.—The cause may be any effective obstruction to the act of parturition, such as lack of contractile power in the womb, unduly strong adhesions between the womb and the fetal membranes, wrong presentation of the fetus, contracted pelvis (from fracture or disease of the bones), or disease and induration of the neck of the womb.

The mere prolongation of gestation does not necessarily entail the death of the foal; hence the latter has been born alive at the four hundredth day. Even when the foal has perished, putrefaction does not set in unless the membranes have been ruptured and septic bacteria have been admitted to the interior of the womb. In the latter case a fetid decomposition advances rapidly, and the mare usually perishes from poisoning with the putrid matters absorbed.

At the natural period of parturition preparations are apparently made for that act. The vulva swells and discharges much mucus, the udder enlarges, the belly becomes more pendent, and the animal strains more or less. No progress is made, however; there is not even opening of the neck of the womb, and after a time the symptoms subside. The mare usually refuses the male; yet there are exceptions to this rule. If the neck of the womb has been opened and putrefying changes have set in in its contents, the mare loses appetite and condition, pines, discharges an offensive matter from the generative passages, and dies of inflammation of the womb and putrid infection. In other cases there is a slow wearing out of the strength, and the mare finally dies of exhaustion.

The treatment is such as will facilitate the expulsion of the fetus and its membranes and the subsequent washing out of the womb with disinfectants. So long as the mouth of the womb is closed time should be allowed for its natural dilatation, but if this does not come about after a day or two of straining, the opening may be smeared with extract of belladonna, and the oiled hand, with the fingers and thumb drawn into the form of a cone, may be inserted by slow oscillating movements into the interior of the womb. The water bags may now be ruptured, any malpresentation rectified, and delivery effected. After removal of the membranes wash out the womb first with tepid water and then with a solution of 2 ounces of borax in half a gallon of water.

This injection may have to be repeated if a discharge sets in. The same course may be pursued even after prolonged retention. If the soft parts of the fetus have been absorbed and the bones only left, these must be carefully sought for and removed, and subsequent daily injections will be required for some time. In such cases, too, a course of iron tonics (sulphate of iron, 2 drams daily) will be highly beneficial in restoring health and vigor.

ABORTION.

Abortion is, strictly speaking, the expulsion of the impregnated ovum at any period from the date of impregnation until the foal can survive out of the womb. If the foal is advanced enough to live, it is *premature parturition,* and in the mare this may occur as early as the tenth month.

The mare may abort by reason of almost any cause that very profoundly disturbs the system. Hence very violent inflammations of important internal organs may induce abortion. Profuse diarrhea, whether occurring from the reckless use of purgatives, the consumption of irritants in the food, or a simple indigestion, is an effective cause. No less so is acute indigestion with evolution of gas in the intestines. The presence of stone in the kidneys, uterus, bladder, or urethra may induce so much sympathetic disorder in the womb as to induce abortion. In exceptional cases wherein mares come in heat during gestation, service by the stallion may cause abortion. Blows or pressure on the abdomen, rapid driving or riding of the pregnant mare, especially if she is soft and out of condition from idleness, the brutal use of the spur or whip, and the jolting and straining of travel by rail or boat are prolific causes. Bleeding the pregnant mare, a painful surgical operation, and the throwing and constraint resorted to for an operation are other causes. Traveling on heavy, muddy roads, slips and falls on ice, and jumping must be added. The stimulation of the abdominal organs by a full drink of iced water may precipitate a miscarriage, as may exposure to a cold rainstorm or a very cold night after a warm day. Irritant poisons that act on the urinary or generative organs, such as Spanish flies, the smut of maize and other grain, and musty fodder are additional causes. Frosted food, indigestible food, and, above all, green succulent vegetables in a frozen state, have proved effective factors, and filthy, stagnant water is dangerous. Low condition in the dam and plethora have in opposite ways caused abortion, and hot, relaxing stables and lack of exercise strongly conduce to it. The exhaustion of the sire by too frequent service, entailing debility of the offspring and disease of the fetus or of its envelopes, must be recognized as a further cause.

The symptoms vary mainly according as the abortion is early or late in pregnancy. In the first month or two of pregnancy the mare may miscarry without observable symptoms, and the fact only appears by her coming in heat. If more closely observed a small clot of blood may be found behind her, in which a careful search reveals the rudiments of the foal. If the occurrence is somewhat later in gestation, there will be some general disturbance, neighing, and straining, and the small body of the fetus is expelled, enveloped in its membranes. Abortions during the later stages of pregnancy are attended with greater constitutional disturbance, and the process resembles normal parturition, with the aggravation that more effort and straining is requisite to force the fetus through the comparatively undilatable mouth of the womb. There is the swelling of the vulva, with mucus or even bloody discharge; the abdomen droops, the flanks fall in, the udder fills, the mare looks at her flanks, paws with the fore feet and kicks with the hind, switches the tail, moves around uneasily, lies down and rises, strains, and, as in natural foaling, expels first mucus and blood, then the waters, and finally the fetus. This may occupy an hour or two, or it may be prolonged for a day or more, the symptoms subsiding for a time, only to reappear with renewed energy. If there is malpresentation of the fetus it will hinder progress until rectified, as in difficult parturition.

The most important object in an impending abortion is to recognize it at as early a stage as possible, so that it may, if possible, be cut short and prevented. Any general indefinable illness in a pregnant mare should lead to a close examination of the vulva as regards swelling, vascularity of its mucous membrane, and profuse mucus secretion, and, above all, any streak or staining of blood; also the condition of the udder, if that is congested and swollen. Any such indication, with colicky pains, straining, however little, and active movement of the fetus or entire absence of movement, are suggestive symptoms and should be duly counteracted.

The changes in the vulva and udder, with a soiled and bloody condition of the tail, may suggest an abortion already accomplished, and the examination with the hand in the vagina may detect the mouth of the womb soft and dilatable and the interior of the organ slightly filled with a bloody liquid.

Treatment.—This should be prevented if possible, and would embrace the avoidance of all causes mentioned, and particularly of such as may seem to be particularly operative in the particular case. Where abortions have already occurred in a stud, the especial cause in the matter of food, water, exposure to injuries, overwork, lack of exercise, etc., may often be identified and removed. A most important point is to avoid all causes of constipation, diarrhea, indigestion, bloating, violent purgatives, diuretics or other potent medicines, painful operations, and slippery roads, unless well frosted.

When abortion is imminent, the mare should be placed alone in a roomy, dark, quiet stall, and have the straining checked by some sedative. Laudanum is usually at hand and may be given in doses of 1 or 2 ounces, according to size, and repeated after two or three hours, and even daily if necessary. Chloroform or chloral hydrate, 3 drams, may be substituted if more convenient. These should be given in a pint or quart of water, to avoid burning the mouth and throat.

When all measures fail and miscarriage proceeds, all that can be done is to assist in the removal of the fetus and its membranes, as in ordinary parturition. As in the case of retention of the fetus, it may be necessary after delivery to employ antiseptic injections into the womb to counteract putrid fermentation. This, however, is less requisite in the mare than in the cow, in which the prevalent contagious abortion must be counteracted by the persistent local use of antiseptics. After abortion a careful hygiene is demanded, especially in the matter of pure air and easily digestible food. The mare should not be served again for a month or longer, and in no case until after all discharge from the vulva has ceased.

SYMPTOMS OF PARTURITION.

As the period of parturition approaches, the swelling of the udder bespeaks the coming event, the engorgement in exceptional cases extending forward on the lower surface of the abdomen and even into the hind limbs. For about a week a serous fluid oozes from the teat and concretes as a yellow, waxlike mass around its orifice. About twenty-four hours before the birth this gives place to a whitish, milky liquid, which falls upon and mats the hairs on the inner sides of the legs. Another symptom is enlargement of the vulva, with redness of its lining membrane, and the escape of glairy mucus. The belly droops, the flanks fall in, and the loins may even become depressed. Finally the mare becomes uneasy, stops feeding, looks anxious, whisks her tail, and may lie down and rise again. In many mares this is not repeated, but the mare remains down; violent contractions of the abdominal muscles ensue; after two or three pains the water bags appear and burst, followed by the fore feet of the foal, with the nose between the knees, and by a few more throes the fetus is expelled. In other cases the act is accomplished standing. The whole act may not occupy more than five or ten minutes. This, together with the disposition of the mare to avoid observation, renders the act one that is rarely seen by the attendants. The navel string, which connects the foal to the membranes, is ruptured when the fetus falls to the ground, or when the mare rises, if she has been down, and the membranes are expelled a few minutes later.

NATURAL PRESENTATION.

When there is a single foal, the common and desirable presentation is with the fore feet first, the nose between the knees, and with the front of the hoofs and knees and the forehead directed upward toward the anus, tail, and croup. In this way the natural curvature of the body of the fetus corresponds to the curve of the womb and genital passages, and particularly of the bony pelvis, and the foal passes with much greater ease than if it were placed with its back downward toward the udder. When there is a twin birth the second foal usually comes with its hind feet first, and the backs of the legs, the points of the hocks, and the tail and croup are turned upward toward the anus and tail of the mare. In this way, even with a posterior presentation, the curvature of the body of the foal still corresponds to that of the passages, and its expulsion may be quite as easy as in anterior presentation.

PREMATURE LABOR PAINS.

These may be brought on by any violent exertion, use under the saddle, or in heavy draft, or in rapid paces, or in travel by rail or sea, blows, kicks, crushing by other animals in a doorway or gate. Excessive action of purgative, or of agents that irritate the bowels or kidneys, like arsenic, paris green, all caustic salts and acids, is equally injurious. Finally, the ingestion of agents that stimulate the action of the gravid womb may bring on labor pains prematurely.

Besides the knowledge that parturition is not yet due, there will be less enlargement, redness, and swelling of the vulva, less mucous discharge, less filling of the udder, and less appearances of wax and probably none of the milk from the ends of the teats. The oiled hand introduced into the vulva will not enter with the ease usual at full term, and the neck of the womb will be felt not only closed, but with its projecting papillæ, through which it is perforated, not yet flattened down and effaced, as at full term. The symptoms are indeed those of threatened abortion, but at such an advanced stage of gestation as is compatible with the survival of the offspring.

Treatment.—The treatment consists in the separation of the mare from all other animals in a quiet, dark, secluded place, and the free use of antispasmodics and anodynes. Opium in dram doses every two hours, or laudanum in ounce doses at similar intervals, will often suffice. When the more urgent symptoms have subsided these doses may be repeated thrice a day till all excitement passes off or until the passages have become relaxed and prepared for parturition. Should parturition become inevitable, it may be favored and any necessary assistance furnished.

EMBRYOTOMY.

This consists in the dissection of the fetus, so as to reduce its bulk and allow of its exit through the pelvis. The operation will vary in different cases according to the necessity for the removal of one or more parts in order to secure the requisite reduction in size. Thus it may be needful to remove head and neck, one fore limb or both, one hind limb or both, to remove different parts of the trunk, or to remove superfluous parts.

Amputation of the Head.—This is easy when both fore limbs are turned back and the head alone has made its exit in part. It is more difficult when the head is still retained in the passages or womb, as in double-headed monsters. The head is secured by a hook in the lower jaw, or in the orbit, or by a halter, and the skin is divided circularly around the lower part of the face or at the front of the ears, according to the amount of head protruding. Then an incision is made backward along the line of the throat, and the skin is dissected from the neck as far back as possible. Then the muscles and other soft parts of the neck are cut across, and the bodies of two vertebræ (neck bones) are severed by cutting completely across the cartilage of the joint. The bulging of the ends of the bones will serve to indicate the seat of the joint. The head and detached portion of the neck may now be removed by steady pulling. If there is still an obstacle, the knife may be again used to sever any obstinate connections. In the case of a double-headed monster, the whole of the second neck must be removed with the head. When the head has been detached, a rope should be passed through the eyeholes, or through an artificial opening in the skin, and tied firmly around the skin, to be employed as a means of traction when the missing limbs or the second head have been brought up into position.

Amputation of the Hind Limb.—This may be required when there are extra hind limbs or when the hind limbs are bent forward at hock or hip joint. In the former condition the procedure resembles that for removal of a fore limb, but requires more anatomical knowledge. Having noosed the pastern, a circular incision is made through the skin around the fetlock, and a longitudinal one from that up to the groin, and the skin is dissected from the limb as high up as can be reached, over the croup, if possible. Then cut through the muscles around the hip joint, and, if possible, the ligaments of the joint, and extract the limb by strong dragging.

Amputation of the Fore Limbs.—This may usually be begun on the fetlock of the limb projecting from the vulva. An embryotomy knife is desirable. This knife consists of a blade with a sharp, slightly hooked point, and one or two rings in the back of the blade large enough to fit on the middle finger, while the blade is protected in the palm of the hand. Another form has the blade inserted in a mortise in the handle, from which it is pushed out by a movable button when wanted. First place a noose around the fetlock of the limb to be amputated, cut the skin circularly entirely around the fetlock, then make an incision on the inner side of the limb from the fetlock up to the breastbone. Next dissect the skin from the limb, from the fetlock up to the breastbone on the inner side, and as far up on the shoulder blade as possible on the outer side. Finally, cut through the muscles attaching the limb to the breastbone, and employ strong traction on the limb, so as to drag out the whole limb, shoulder blade included. The muscles around the upper part of the shoulder blade are easily torn through and need not be cut, even if that were possible. In no case should the fore limb be removed unless the shoulder blade is taken with it, as that furnishes the greatest obstruction to delivery, above all when it is no longer advanced by the extension of the fore limb, but is pressed back so as to increase the already thickest posterior portion of the chest. The preservation of the skin from the whole limb is advantageous in various ways; it is easier to cut it circularly at the fetlock than at the shoulder; it covers the hand and knife in making the needful incisions, thus acting as a protection to the womb; and it affords a means of traction on the body after the limb has been removed. In dissecting the skin from the limb the knife is not needful at all points; much of it may be stripped off with the fingers or knuckles, or by a blunt iron spud pushed up inside the hide, which is meanwhile held tense to render the spud effective.

In case the limb is bent forward at the hock, a rope is passed round that and pulled so as to bring the point of the hock between the lips of the vulva. The hamstring and the lateral ligaments of the hock are now cut through, and the limbs extended by a rope tied round the lower end of the long bone above. In case it is still needful to remove the upper part of the limb, the further procedure is the same as described in the last paragraph.

Removal of the Abdominal Viscera.—In case the belly is unduly large, from decomposition, tumors, or otherwise, it may be needful to lay it open with the knife and cut or tear out the contents.

Removal of the Thoracic Viscera.—To diminish the bulk of the chest it has been found advisable to cut out the breastbone, remove the heart and lungs, and allow the ribs to collapse with the lower free ends overlapping each other.

Dissection of the Trunk.—In case it becomes necessary to remove other portions of the trunk, the general rule should be followed of preserving the skin so that all manipulations can be made inside this as a protector, that it may remain available as a means of exercising traction on the remaining part of the body, and as a covering to protect the vaginal walls against injuries from bones while such part is passing.

DIFFICULT PARTURITION FROM NARROW PELVIS.

A disproportion between the fetus got by a large stallion and the pelvis of a small dam is a serious obstacle to parturition, sometimes seen in the mare. This is not the rule, however, as the foal up to birth usually accommodates itself to the size of the dam, as illustrated in the successful crossing of Percheron stallions on mustang mares.

FRACTURED HIP BONES.

More commonly the obstruction comes from distortion and narrowing of the pelvis as the result of fractures. Fractures at any point of the lateral wall or floor of the pelvis are repaired with the formation of an extensive bony deposit bulging into the passage of the pelvis. The displacement of the ends of the broken bone is another cause of constriction, and between the two conditions the passage of the fetus may be rendered impossible without embryotomy. Fracture of the sacrum (the continuation of the backbone forming the croup) leads to the depression of the posterior part of that bone in the roof of the pelvis and the narrowing of the passage from above downward by a bony ridge presenting its sharp edge forward. In all cases in which there has been injury to the bones of the pelvis the obvious precaution is to withhold the mare from breeding and to use her for work only.

If a mare with a pelvis thus narrowed has got in foal inadvertently, abortion may be induced in the early months of gestation by slowly introducing the oiled finger through the neck of the womb and following this by the other fingers until the whole hand has been introduced. Then the water bags may be broken, and with the escape of the liquid the womb will contract on the solid fetus and labor pains will ensue. The fetus being small will pass easily.

SPASM OF THE NECK OF THE WOMB.

This occurs in the mare of specially excitable temperament, or under particular causes of irritation, local or general. Labor pains, though continuing for some time, produce no dilatation of the neck of the womb, which will be found firmly closed so as to admit but one or two fingers, and this, although the projection at the mouth of the womb may have been entirely effaced, so that a simple round opening is left, with rigid margins.

Treatment.—The simplest treatment consists in smearing this part with solid extract of belladonna, and after an interval inserting the hand with fingers and thumb drawn into the form of a cone, rupturing the membranes and bringing the fetus into position for extraction, as advised under "Prolonged Retention of the Fetus." Another mode is to insert through the neck of the womb an ovoid caoutchouc bag, empty, and furnished with an elastic tube 12 feet long. Carry the free end of this tube upward to a height of 8, 10, or 12 feet, insert a filler into it, and proceed to distend the bag with tepid or warm water.

FIBROUS CONSTRICTION OF VAGINA OR VULVA.

This is probably always the result of direct mechanical injury and the formation of rigid cicatrices which fail to dilate with the remainder of the passages at the approach of parturition. The presentation of the fetus in the natural way and the occurrence of successive and active labor pains without any favorable result will direct attention to the rigid and unyielding cicatrices which may be incised at one, two, or more points to a depth of half an inch or more, after which the natural expulsive efforts will usually prove effective. The resulting wounds may be washed frequently with a solution of 1 part of carbolic acid to 50 parts of water, or of 1 part of mercuric chloride to 1,000 parts of water.

FETUS ADHERENT TO THE WALLS OF THE WOMB.

In inflammation of the mucous membrane lining the cavity of the womb and implicating the fetal membranes, the resulting embryonic tissue sometimes establishes a medium of direct continuity between the womb and fetal membranes; the blood vessels of the one communicate freely with those of the other and the fibers of the one are prolonged into the other. This causes retention of the membranes after birth, and a special risk of bleeding from the womb, and of septic poisoning. In exceptional cases the adhesion is more extensive and binds a portion of the body of the foal firmly to the womb. In such cases it has repeatedly been found impossible to extract the foal until such adhesions were broken down. If they can be reached with the hand and recognized, they may be torn through with the fingers or with a blunt hook, after which delivery may be attempted with hope of success.

EXCESSIVE SIZE OF THE FETUS.

It would seem that a small mare may usually be safely bred to a large stallion, yet this is not always the case, and when the small size is an individual rather than a racial characteristic or the result of being very young, the rule can not be expected to hold. There is always great danger in breeding the young, small, and undeveloped female, and the dwarfed representative of a larger breed, as the offspring tend to partake of the large race characteristics and to show them even prior to birth. When impregnation has occurred in the very young or in the dwarfed female, there are two alternatives—to induce abortion or to wait until there are attempts at parturition and to extract by embryotomy if impractical otherwise.

CONSTRICTION OF A MEMBER BY THE NAVEL STRING.

In man and animals alike the winding of the umbilical cord around a member of the fetus sometimes leads to the amputation of the latter. It is also known to get wound around the neck or a limb at birth, but in the mare this does not seriously impede parturition, as the loosely attached membranes are easily separated from the womb and no strangulation or retarding occurs. The foal may, however, die from the cessation of the placental circulation unless it is speedily delivered.

CONTRACTIONS OF MUSCLES.

The foal is not always developed symmetrically, but certain groups of muscles are liable to remain short, or to shorten because of persistent spasmodic contraction, so that even the bones become distorted and twisted. This is most common in the neck. The bones of this part and even of the face are drawn to one side and shortened, the head being held firmly to the flank and the jaws being twisted to the right or left. In other cases the flexor muscles of the fore limbs are contracted so that these members are strongly bent at the knee. In neither of these cases can the distorted part be extended and straightened, so that body or limbs must necessarily present double, and natural delivery is rendered impossible. The bent neck may sometimes be straightened after the muscles have been cut on the side to which it is turned, and the bent limbs after the tendons on the back of the shank bone have been cut across. Failing to accomplish this, the next resort is embryotomy.

TUMORS OF THE FETUS, OR INCLOSED OVUM.

Tumors or diseased growths may form on any part of the foal, internal or external, and by their size impede or hinder parturition. In some cases what appears as a tumor is an imprisoned and undeveloped ovum, which has grafted itself on the fetus. These are usually sacculated, and may contain skin, hair, muscle, bone, and other natural tissues. The only course to be pursued in such cases is to excise the tumor, or, if this is not feasible, to perform embryotomy.

ENTRANCE OF TWINS INTO THE PASSAGE AT ONCE.

Twins are rare in the mare, and still more rare is the impaction of both at once into the pelvis. The condition would be easily recognized by the fact that the two fore limbs and two hind would occupy the passage at once, the front of the hoofs of the fore feet being turned upward and those of the hind feet downward. If both belonged to one foal they would be turned in the same direction. Once recognized, the condition is easily remedied by passing a rope with a running noose round each foot of the foal that is farthest advanced or that promises to be most easily extracted, and to push the members of the other fetus back into the depth of the womb. As soon as the one fetus is fully engaged in the passage it will hold its place and its delivery will proceed in the natural way.

FORE LIMBS INCOMPLETELY EXTENDED.

In cases of this kind, not only are the back tendons behind the knee and shank bone unduly short, but the sinew extending from the front of the shoulder blade over the front of the elbow and down to the head of the shank bone is also shortened. The result is that the fore limb is bent at the knee and the elbow is also rigidly bent. The condition obstructs parturition by the feet becoming pressed against the floor of the pelvis or by the elbow pressing on its anterior brim. Relief is to be obtained by forcible extension. A rope with a running noose is passed around each fetlock and a repeller planted in the breast is pressed in a direction upward and backward while active traction is made on the ropes. If the feet are not thereby raised from the floor of the pelvis the palm of the hand may be placed beneath them to protect the mucous membrane until they have advanced sufficiently to obviate this danger. In the absence of a repeller, a smooth rounded fork handle may be employed. If the shortening is too great to allow of the extension of the limbs in this way, the tense tendons may be cut across behind the shank bone and in front of the elbow, and the limb will be easily straightened out. This is most easily done with an embryotomy knife furnished with a ring for the middle finger, so that the blade may be protected in the palm of the hand.

ONE FORE LIMB CROSSED OVER THE BACK OF THE NECK.

With the long fore limbs of the foal this readily occurs, and the resulting increase in thickness, both at the head and shoulder, offers a serious obstacle to progress. The hand introduced into the passage detects the head and one fore foot, and farther back on the same side of the head the second foot, from which the limb may be traced obliquely across the back of the neck. If parturition continues to make progress the displaced foot may bruise and lacerate the vagina. By seizing the limb above the fetlock it may be easily pushed over the head to the proper side, when parturition will proceed normally.

FORE LIMB BENT AT THE KNEE.

The nose and one fore foot present, and on examination the knee of the missing fore limb is found farther back. First place a noose each on the presenting pastern and lower jaw, and push back the body of the fetus, while the operator seizing the shank of the bent limb extends it so as to press back the knee and bring forward the fetlock and foot. As progress is made little by little the hand is slid down from the region of the knee to the fetlock, and finally that is secured and brought up into the passage, when parturition will proceed without hindrance. If both fore limbs are bent back the head must be noosed and the limbs brought up as above, one after the other. It is usually best to employ the left hand for the right fore limb, and the right hand for the left fore limb.

FORE LIMB TURNED BACK FROM THE SHOULDER.

In this case, on exploration by the side of the head and presenting limb, the shoulder only can be reached at first. By noosing the head and presenting fore limb, these may be drawn forward into the pelvis, and the oiled hand being carried along the shoulder in the direction of the missing limb is enabled to reach and seize the forearm just below the elbow. The body is now pushed back by the assistants pressing on the head and presenting limb or on a repeller planted in the breast until the knee can be brought up into the pelvis, after which the procedure is the same as described in the last paragraph.

HEAD BENT DOWN BETWEEN THE FORE LIMBS.

This may be so that the poll or nape of the neck, with the ears, can be felt far back between the fore limbs, or so that only the upper border of the neck can be reached, head and neck being bent back beneath the body. With the head only bent on the neck, noose the two presenting limbs, then introduce the hand between them until the nose can be seized in the palm of the hand. Next have the assistants push back the presenting limbs, while the nose is strongly lifted upward over the brim of the pelvis. This accomplished, it assumes the natural position and parturition is easy.

When both head and neck are bent downward it may be impossible to reach the nose. If, however, the labor has only commenced, the limbs may be drawn upon until the operator can reach the ear, by dragging on which the head may be so far advanced that the fingers may reach the orbit; traction upon this while the limbs are being pushed back may bring the head up so that it bends on the neck only, and the further procedure will be as described in the last paragraph.

If the labor has been long in progress and the fetus is jammed into the pelvis, the womb emptied of the waters and firmly contracted on its solid contents, the case is incomparably more difficult. The mare may be chloroformed and turned on her back with hind parts elevated, and the womb may be injected with sweet oil. Then, if the ear can be reached, the correction of the malpresentation may be attempted as above described. Should this fail, one or more sharp hooks may be inserted in the neck as near the head as can be reached, and ropes attached to these may be dragged on, while the body of the foal is pushed back by the fore limbs or by a repeller. Such repulsion should be made in a direction obliquely upward toward the loins of the mother, so as to rotate the fetus in such a way as to bring the head up. As this is accomplished a hold should be secured nearer and nearer to the nose, with hand or hook, until the head can be straightened out on the neck.

All means failing, it becomes necessary to remove the fore limbs so as to make more space for bringing up the head. If, even then, this can not be accomplished, it may be possible to push the body backward and upward with the repeller until the hind limbs are brought to the passage, when they may be noosed and delivery effected with the posterior presentation.

HEAD TURNED BACK ON THE SHOULDER.

In this case the fore feet present, and the oiled hand passed along the forearms in search of the missing head finds the side of the neck turned to one side, the head being perhaps entirely out of reach. To bring forward the head it may be desirable to lay the mare on the opposite side to that to which the head is turned, and even to give chloroform or ether. Then the feet being noosed, the body of the fetus is pushed by the hand or repeller forward and to the side opposite to that occupied by the head until the head comes within reach, near the entrance of the pelvis. If such displacement of the fetus is difficult, it may be facilitated by a free use of oil or lard. When the nose can be seized it can be brought into the passage, as when the head is turned down. If it can not be reached, the orbit may be availed of to draw the head forward until the nose can be seized or the lower jaw noosed. In very difficult cases a rope may be passed around the neck by the hand or with the aid of a curved carrier, and traction may be made upon this while the body is being rotated to the other side. In the same way in bad cases a hook may be fixed in the orbit or even between the bones of the lower jaw to assist in bringing the head up into position. Should all fail, the amputation of the fore limbs may be resorted to as advised under the last heading.

HEAD TURNED UPWARD ON THE BACK.

This differs from the last malpresentation only in the direction of the head, which has to be sought above rather than at one side, and is to be secured and brought forward in a similar manner. If a rope can be passed around the neck it will prove most effectual, as it naturally slides nearer to the head as the neck is straightened and ends by bringing the head within easy reach.

HIND FEET ENGAGED IN THE PELVIS.

In this case fore limbs and head present naturally, but the hind limbs bent forward from the hip and the loins arched allow the hind feet also to enter the passages, and the further labor advances the more firmly does the body of the foal become wedged into the pelvis. The condition is to be recognized by introducing the oiled hand along the belly of the fetus, when the hind feet will be felt advancing. An attempt should at once be made to push them back, one after the other, over the brim of the pelvis. Failing in this, the mare may be turned on her back, head downhill, and the attempt renewed. If it is possible to introduce a straight rope carrier, a noose passed through this may be put on the fetlock and the repulsion thereby made more effective. In case of continued failure the anterior presenting part of the body may be skinned and cut off as far back toward the pelvis as possible; then nooses are placed on the hind fetlocks and traction is made upon these while the quarters are pushed back into the womb. Then the remaining portion is brought away by the posterior presentation.

ANTERIOR PRESENTATION WITH BACK TURNED TO ONE SIDE.

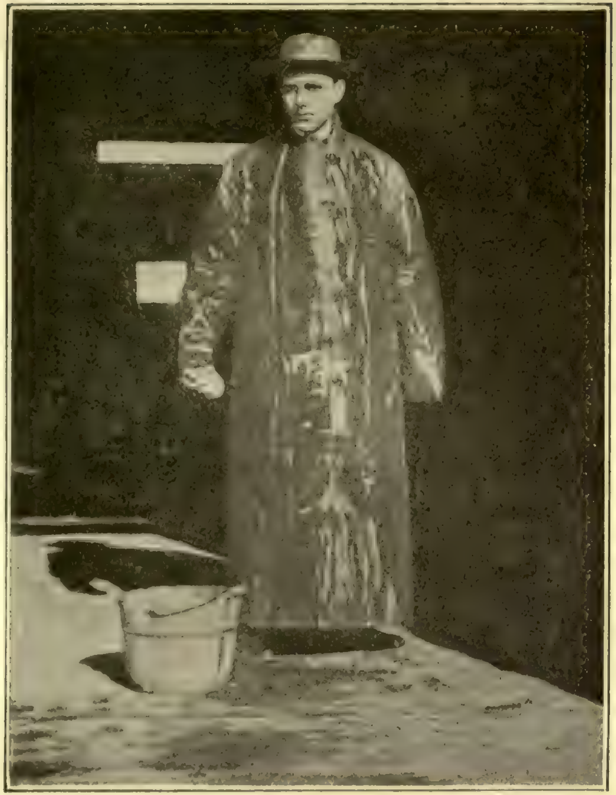
The greatest diameter of the axis of the foal, like that of the pelvic passages, is from above downward, and when the fetus enters the pelvis with this greatest diameter engaged transversely or in the narrow diameter of the pelvis, parturition is rendered difficult or impossible. In such a case the pasterns and head may be noosed, and the passages and engaged portion of the foal freely lubricated with lard, the limbs may be crossed over each other and the head, and a movement of rotation effected in the fetus until its face and back are turned up toward the croup of the mother; then parturition becomes natural.

BACK OF THE FOAL TURNED TO THE FLOOR OF THE PELVIS.

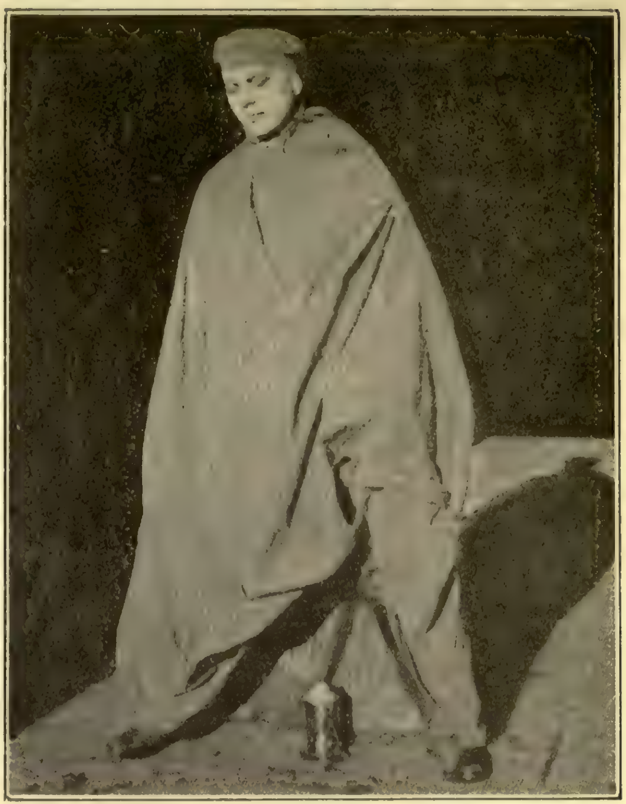
In a roomy mare this is not an obstacle to parturition, yet it may seriously impede it, by reason of the curvature of the body of the foal being opposite to that of the passages, and the head and withers being liable to arrest against the border of the pelvis. Lubrication of the passage with lard and traction of the limbs and head will usually suffice with or without the turning of the mare on her back. In obstinate cases two other resorts are open: First, to turn the foal, pushing back the fore parts and bringing up the hind so as to make a posterior presentation, and, second, the amputation of the fore limbs, after which extraction will usually be easy.

HIND PRESENTATION WITH LEG BENT AT HOCK.

In this form the quarters of the foal with the hind legs bent up beneath them present, but can not advance through the pelvis by reason of their bulk. The oiled hand introduced can recognize the outline of the buttocks, with the tail and anus in the center and the sharp points of the hocks beneath. First pass a rope around each limb at the hock, then with hand or repeller push the buttocks



Attire Worn by Inspectors to Prevent Carrying Contagion. B. A. I. 1912.



Method of Disinfecting Inspectors with Formalin Gas Generated by Lamp Placed Under Rubber Cloak. B. A. I. 1902.

backward and upward, until the feet can be brought up into the passages. The great length of the shank and pastern in the foal is a serious obstacle to this, and in all cases the foot should be protected in the palm of the hand while being brought up over the brim of the pelvis. Otherwise the womb may be torn. When the pains are too violent and constant to allow effective manipulation, some respite may be obtained by the use of chloroform or morphine and by turning the mare on her back, but too often the operator fails and the foal must be sacrificed. Two courses are still open: First, to cut through the cords behind and above the hock and extend the upper part of the limb, leaving the hock bent, and extract in this way, and, second, to amputate the hind limbs at the hip joint and remove them separately, after which the body may be extracted.

HIND PRESENTATION WITH LEGS BENT FORWARD FROM THE HIP.

This is merely an aggravated form of the presentation last described. If the mare is roomy, a rope may be passed around each thigh and the body pushed upward and forward, so as to bring the hocks and heels upward. If this can be accomplished, nooses are placed on the limb farther and farther down until the fetlock is reached and brought into position. If failure is met with, then amputation at the hips is the last resort.

FLOODING, OR BLEEDING FROM THE WOMB.

This is rare in the mare, but not unknown, in connection with a failure of the womb to contract on itself after parturition, or with eversion of the womb (casting the withers), and congestion or laceration. If the blood accumulates in the flaccid womb, the condition may only be suspected by reason of the rapidly advancing weakness, swaying, unsteady gait, hanging head, paleness of the eyes and other mucous membranes, and weak, small, failing pulse. The hand introduced into the womb detects the presence of the blood partly clotted. If the blood escapes by the vulva, the condition is evident.

Treatment consists in evacuating the womb of its blood clots, giving a large dose of powdered ergot of rye, and in the application of cold water or ice to the loins and external generative organs. Besides this, a sponge impregnated with a strong solution of alum, or, still better, with tincture of muriate of iron, may be introduced into the womb and squeezed so as to bring the liquid in contact with the walls generally.

EVERSION OF THE WOMB.

If the womb fails to contract after difficult parturition, the after-pains will sometimes lead to the fundus passing into the body of the organ and passing through that and the vagina until the whole inverted organ appears externally and hangs down on the thighs. The result is rapid engorgement and swelling of the organ, impaction of the rectum with feces, and distention of the bladder with urine, all of which conditions seriously interfere with the return of the mass. In returning the womb the standing is preferable to the recumbent position, as the abdomen is more pendent and there is less obstruction to the return. It may, however, be necessary to put hobbles on the hind limbs to prevent the mare from kicking. A clean sheet should be held beneath the womb, and all filth, straw, and foreign bodies washed from its surface. Then with a broad, elastic (india rubber) band, or in default of that a long strip of calico 4 or 5 inches wide, wind the womb as tightly as possible, beginning at its most dependent part. This serves two good ends. It squeezes out into the general circulation the enormous mass of blood which engorged and enlarged the organ, and it furnishes a strong protective covering for the now delicate friable organ, through which it may be safely manipulated without danger of laceration. The next step may be the pressure on the general mass while those portions next the vulva are gradually pushed in with the hands; or the extreme lowest point may be turned within itself and pushed forward into the vagina by the closed fist, the return being assisted by manipulations by the other hand, and even by those of assistants. By either mode the manipulations may be made with almost perfect safety so long as the organ is closely wrapped in the bandage. Once a portion has been introduced into the vagina the rest will usually follow with increasing ease, and the operation should be completed with the hand and arm extended the full length within the womb and moved from point to point so as to straighten out all parts of the organ and insure that no portion still remains inverted within another portion. Should any such partial inversion be left it will give rise to straining, under the force of which it will gradually increase until the whole mass will be protruded as before. The next step is to apply a truss as an effectual mechanical barrier to further escape of the womb through the vulva. The simplest is made with two inch ropes, each about 18 feet long. These are each doubled and interwoven at the bend. The ring formed by the interlacing of the two ropes is adjusted around the vulva, the two ends of the one rope are carried up on the right and left of the tail and along the spine, being wound round each other in their course, and are finally tied to the upper part of the collar encircling the neck. The remaining two ends, belonging to the other rope, are carried downward and forward between the thighs and thence forward and upward on the sides of the belly and chest to be attached to the right and left sides of the collar. These ropes are drawn tightly enough to keep closely applied to the opening without chafing, and will fit still more securely when the mare raises her back to strain. It is desirable to tie the mare short so that she may be unable to lie down for a day or two, and she should be kept in a stall with the hind parts higher than the fore. Violent straining may be checked by full doses of opium (one-half dram), and any costiveness or diarrhea should be obviated by a suitable laxative or binding diet.

In some mares the contractions are too violent to allow of the return of the womb, and full doses of opium one-half dram, laudanum 2 ounces, or chloral hydrate 1 ounce, may be demanded, or the mare must be rendered insensible by ether or chloroform.

RUPTURE, OR LACERATION OF THE WOMB.

This may occur from the feet of the foal during parturition, or from ill-directed efforts to assist, but it is especially liable to take place in the everted, congested, and friable organ. The resultant dangers are bleeding from the wound, escape of the bowels through the opening and their fatal injury by the mare's feet or otherwise, and peritonitis from the extension of inflammation from the wound and from the poisonous action of the septic liquids of the womb escaping into the abdominal cavity. The first object is to close the wound, but unless in eversion of the womb this is practically impossible. In the last-named condition the wound must be carefully and accurately sewed up before the womb is returned. After its return, the womb must be injected daily with an antiseptic solution (borax, one-half ounce, or carbolic acid, 3 drams to a quart of tepid water). If inflammation threatens, the abdomen may be bathed continuously with hot water by means of a heavy woolen rag, and large doses of opium (one-half dram) may be given twice or thrice daily.

INFLAMMATION OF THE WOMB AND PERITONEUM.

These may result from injuries sustained by the womb during or after parturition, from exposure to cold or wet, or from the irritant infective action of putrid products within the womb. Under the inflammation the womb remains dilated and flaccid, and decomposition of its secretions almost always occurs, so that the inflammation tends to assume a putrid character and general septic infection is likely to occur.

Symptoms.—The symptoms are ushered in by shivering, staring coat, small rapid pulse, elevated temperature, accelerated breathing, inappetence, with arched back, stiff movement of the body, looking back at the flanks, and uneasy motions of the hind limbs, discharge from the vulva of a liquid at first watery, reddish, or yellowish, and later it may be whitish or glairy, and fetid or not in different cases. Tenderness of the abdomen shown on pressure is especially characteristic of cases affecting the peritoneum or lining of the belly, and is more marked lower down. If the animal survives, the inflammation tends to become chronic and attended by a whitish muco-purulent discharge. If, on the contrary, it proves fatal, death is preceded by extreme prostration and weakness from the general septic poisoning.

Treatment.—In treatment the first thing to be sought is the removal of all offensive and irritant matters from the womb through a caoutchouc tube introduced into the womb, and into which a funnel is fitted. Warm water should be passed until it comes away clear. To insure that all of the womb has been washed out, the oiled hand may be introduced to carry the end of the tube into the two horns successively. When the offensive contents have been thus removed, the womb should be injected with a part of water holding in solution 1 dram permanganate of potash, or, in the absence of the latter, 2 teaspoonfuls of carbolic acid. Repeat twice daily. Fomentation of the abdomen, or the application of a warm flaxseed poultice, may greatly relieve. Acetanilid, in doses of half an ounce, repeated twice or thrice a day, may be employed to reduce the fever. If the great prostration indicates septic poisoning, large doses (one-half ounce) of sulphate of quinine may be resorted to.

CONGESTION AND INFLAMMATION OF THE UDDER.

This is comparatively rare in the mare, though in some cases the udder becomes painfully engorged before parturition, and a doughy swelling, pitting on pressure, extends forward on the lower surface of the abdomen. When this goes on to active inflammation, one or both of the glands become enlarged, hot, tense, and painful; the milk is dried up or replaced by a watery or reddish fluid, which at times becomes fetid; the animal walks lame, loses appetite, and shows general disorder and fever. The condition may end in recovery, in abscess, or gangrene, and in some cases may lay the foundation for a tumor of the gland.

Treatment.—The treatment is simple so long as there is only congestion. Active rubbing with lard or oil, or, better, camphorated oil, and the frequent drawing off of the milk, by the foal or with the hand, will usually bring about a rapid improvement. When active inflammation is present, fomentation with warm water may be kept up for an hour and followed by the application of the camphorated oil, to which has been added some carbonate of soda and extract of belladonna. A dose of laxative medicine (4 drams Barbados aloes) will be of service reducing fever, and one-half ounce saltpeter daily will serve a similar end. In case the milk coagulates in the udder and can not be withdrawn, or when the liquid becomes fetid, a solution of 20 grains carbonate of soda and 10 drops carbolic acid dissolved in an ounce of water should be injected into the teat. In doing this it must be noted that the mare has three separate ducts opening on the summit of each teat and each must be carefully injected. When pus forms and points externally and can not find a free escape by the teat, the spot where it fluctuates must be opened freely with the knife and the cavity injected daily with the carbolic-acid lotion. When the gland becomes hard and indolent, it may be rubbed daily with iodine ointment 1 part, vaseline 6 parts.

TUMORS OF THE UDDER.

As the result of inflammation of the udder it may become the seat of an indurated diseased growth, which may go on growing and seriously interfere with the movement of the hind limbs. If such swellings will not give way in their early stages to treatment by iodine, the only resort is to cut them out with a knife. As the gland is often implicated and has to be removed, such mares can not in the future suckle their colts and therefore should not be bred.

SORE TEATS, SCABS, CRACKS, WARTS.

By the act of sucking, especially in cold weather, the teats are subject to abrasions, cracks, and scabs, and as the result of such irritation, or independently, warts sometimes grow and prove troublesome. The warts should be clipped off with sharp scissors and their roots burned with a solid pencil of lunar caustic. This is best done before parturition to secure healing before suckling begins. For sore teats use an ointment of vaseline 1 ounce, balsam of tolu 5 grains, and sulphate of zinc 5 grains.—(Spl. Rpt. Horse, Dept. Agr. 1911.)

DISEASES OF THE EYE.

We can scarcely overestimate the value of sound eyes in the horse, and hence all diseases and injuries which seriously interfere with vision are matters of extreme gravity and apprehension, for should they prove permanent they invariably depreciate the selling price to a considerable extent. A blind horse is always dangerous in the saddle or in single harness, and he is scarcely less so when, with partially impaired vision, he sees things imperfectly, in a distorted form or in a wrong place, and when he shies or avoids objects which are commonplace or familiar. When we add to this that certain diseases of the eyes, like moon blindness, are habitually transmitted from parent to offspring, we can realize still more fully the importance of these maladies. Again, as a mere matter of beauty, a sound, full, clear, intelligent eye is something which must always add a high value to our equine friends and servants.

THE EYEBALL.

A full description of the structure of the eye is incompatible with our prescribed limits, and yet a short description is absolutely essential to the clear understanding of what is to follow.

The horse's eye is a spheroidal body, flattened behind, and with its posterior four-fifths inclosed by an opaque, white, strong, fibrous membrane (the sclerotic), on the inner side of which is laid a more delicate friable membrane, consisting mainly of blood vessels and pigment cells (the choroid), and that in its turn is lined by the extremely delicate and sensitive expansion of the nerve of sight (the retina). The anterior fifth of the globe of the eye bulges forward from what would have been the direct line of the sclerotic, and thus forms a segment of a much smaller sphere than is inclosed by the sclerotic. Its walls, too, have in health a perfect translucency from which it has derived the name of transparent cornea. This transparent coat is composed, in the main, of fibers with lymph interspaces, and it is to the condition of these and their condensation and compression that the translucency is largely due. This may be shown by compressing with the fingers the eye of an ox which has just been killed, when the clear transparent cornea will suddenly become clouded over with a whitish blue opacity, and this will remain until the compression is interrupted. The interior of the eye contains three transparent media for the refraction of the rays of light on their way from the cornea to the visual nerve. Of these media the anterior one (aqueous humor) is liquid, the posterior (vitreous humor) is semi-solid, and the intermediate one (crystalline lens) is solid. The space occupied by the aqueous humor corresponds nearly to the portion of the eye covered by the transparent cornea. It is, however, divided into two chambers, anterior and posterior, by the iris, a contractile curtain with a hole in the center (the pupil), and which may be looked on as in some sense a projection inward of the vascular and pigmentary coat from its anterior margin at the point where the sclerotic or opaque outer coat becomes continuous with the cornea or transparent one. This iris, or curtain, besides its abundance of blood vessels and pigment, possesses two sets of muscular fibers, one set radiating from the margin of the pupil to the outer border of the curtain at its attachment to the sclerotic and choroid, and the other encircling the pupil in the manner of a ring. The action of the two sets is necessarily antagonistic, the radiating fibers dilating the pupil and exposing the interior of the eye to view, while the circular fibers contract this opening and shut out the rays of light. The form of the pupil in the horse is ovoid, with its longest diameter from side to side, and its upper border is fringed by several minute black bodies projecting forward and serving to some extent the purpose of eyebrows in arresting and absorbing the excess of rays of light which fall upon the eye from above. These pigmentary projections in front of the upper border of the pupil are often mistaken for the products of disease or injury, in place of the normal and beneficent protectors of the nerve of sight which they are. They may, like all other parts, become the seat of disease, but so long as they and the iris retain their clear, dark aspect, without any tints of brown or yellow, they may be held to be healthy.

The vitreous or semisolid refracting medium occupies the posterior part of the eye—the part corresponding to the sclerotic, choroid, and retina—and has a consistency corresponding to that of the white of an egg, and a power of refraction of the light rays correspondingly greater than the aqueous humor.

The third or solid refracting medium is a biconvex lens, with its convexity greatest on its posterior surface, which is lodged in a depression in the vitreous humor, while its anterior surface corresponds to the opening of the pupil. It is inclosed in a membranous covering (capsule) and is maintained in position by a membrane (suspensory ligament) which extends from the margin of the lens outward to the sclerotic at the point of junction of the choroid and iris. This ligament is, in its turn, furnished with radiating muscular fibers, which change the form or position of the lens so as to adapt it to see with equal clearness objects at a distance or close by.

Another point which strikes the observer of the horse's eye is that in the darkness a bright bluish tinge is reflected from the widely dilated pupil. This is owing to a comparative absence of pigment in the choroid coat inside the upper part of the eyeball, and enables the animal to see and advance with security in darkness where the human eye would be of little use. The lower part of the cavity of the horse's eye, into which the dazzling rays fall from the sky, is furnished with an intensely black lining, by which the rays penetrating the inner nervous layer are instantly absorbed.

MUSCLES OF THE EYE.

These consist of four straight muscles, two oblique and one retractor. The straight muscles pass from the depth of the orbit forward on the inner, outer, upper, and lower sides of the eyeball, and are fixed to the antèrior portion of the fibrous (sclerotic) coat, so that in contracting singly they respectively turn the eye inward, outward.

upward, and downward. When all act together they draw the eyeball deeply into its socket. The retractor muscle also consists of four muscular slips, repeating the straight muscles on a smaller scale, but as they are only attached on the back part of the eyeball they are less adapted to roll the eye than to draw it down into its socket. The two oblique muscles rotate the eye on its own axis, the upper one turning its outer surface upward and inward, and the lower one turning it downward and inward.

THE HAW (THE WINKING CARTILAGE, OR CARTILAGO NICTITANS).

This is a structure, which, like the retractor muscle, is not found in the eye of man, but it serves in the lower animals to assist in removing foreign bodies from the front of the eyeball. It consists, in the horse, of a cartilage of irregular form, thickened inferiorly and posteriorly where it is intimately connected with the muscles of the eyeball and the fatty material around them, and expanded and flattened anteriorly where its upper surface is concave, and, as it were, molded on the lower and inner surface of the eyeball. Externally it is covered by the mucous membrane which lines the eyelids and extends over the front of the eye. In the ordinary restful state of the eye the edge of this cartilage should just appear as a thin fold of membrane at the inner angle of the eye, but when the eyeball is drawn deeply into the orbit the cartilage is pushed forward, outward, and upward over it until the entire globe may be hidden from sight. This protrusion of the cartilage, so as to cover the eye, may be induced in the healthy eye by pressing the finger and thumb on the upper and lower lids, so as to cause retraction of the eyeball into the socket. When foreign bodies, such as sand, dust, and chaff, or other irritants have fallen on the eyeball or eyelids, it is similarly projected to push them off, their expulsion being further favored by a profuse flow of tears.

This is seen, to a lesser extent, in all painful inflammations of the eye, and to a very marked degree in lockjaw, when the spasm of the muscles of the eyeball draws the latter deeply into the orbit and projects forward the masses of fat and the cartilage. The brutal practice of cutting off this apparatus, whenever it is projected, necessitates this explanation which, it is hoped, may save to many a faithful servant a most valuable appendage. That the cartilage and membrane may become the seat of disease is undeniable, but so long as its edge is thin and even, and its surface smooth and regular, the mere fact of its projection over a portion or the whole of the eyeball is no evidence of disease in its substance, nor any warrant for its removal. It is usually but the evidence of the presence of some pain in another part of the eye, which the suffering animal endeavors to assuage by the use of this beneficent provision.

LACHRYMAL APPARATUS.

This consists, first, of a gland for the secretion of the tears, and, second, of a series of canals for the conveyance of the superfluous tears into the cavity of the nose. The gland is situated above the outer part of the eyeball, and the tears which have flowed over the eye and reached the inner angle are there directed by a small conical papilla (lachrymal caruncle) into two minute orifices, and thence by two ducts (lachrymal) to a small pouch (lachrymal sac) from which a canal leads through the bones of the face into the nose. This opens in the lower part of the nose on the floor of the passage and a little outside the line of union of the skin which lines the false nostril with the mucous membrane of the nose. In the ass and mule this opening is situated on the roof instead of the floor of the nose, but still close to the external opening.

EXAMINATION OF THE EYE.

To avoid unnecessary repetition the following general directions are given for the examination of the eye: The eye, and to a certain extent the mucous membrane lining the eyelids, may be exposed to view by gently parting the eyelids with the thumb and forefinger pressed on the middle of the respective lids. The pressure, it is true, causes the protrusion of the haw over a portion of the lower and inner part of the eye, but by gentleness and careful graduation of the pressure this may be kept within bounds, and oftentimes even the interior of the eye can be seen. As a rule it is best to use the right hand for the left eye, and the left hand for the right eye, the finger in each case being pressed on the upper lid while the thumb depresses the lower one. In cases in which it is desirable to examine the inner side of the eyelid further than is possible by the above means, the upper lid may be drawn down by the eyelashes with the one hand and then everted over the tip of the forefinger of the other hand, or over a probe laid flat against the middle of the lid. Where the interior of the eye must be examined it is useless to make the attempt in the open sunshine or under a clear sky. The worst cases, it is true, can be seen under such circumstances, but for the slighter forms the horse should be taken indoors, where all light from above will be shut off, and should be placed so that the light shall fall on the eye from the front and side. Then the observer, placing himself in front of the animal, will receive the reflected rays from the cornea, the front of the lens and the back, and can much more easily detect any cloudiness, opacity or lack of transparency. The examination can be made much more satisfactory by placing the horse in a dark chamber and illuminating the eye by a lamp placed forward and outward from the eye which is to be examined. Any cloudiness is thus easily detected, and any doubt may be resolved by moving the lamp so that the image of the flame may be passed in succession over the whole surface of the transparent cornea and of the crystalline lens. Three images of the flame will be seen, the larger one upright, reflected from the anterior surface of the eye; a smaller one upright, reflected from the anterior surface of the lens; and a second small one inverted from the back surface of the lens.

So long as these images are reflected from healthy surfaces they will be clear and perfect in outline, but as soon as one strikes on an area of opacity it will become diffused, cloudy, and indefinite. Thus, if the large upright image becomes hazy and imperfect over a particular spot of the cornea, that will be found to be the seat of disease and opacity. Should the large image remain clear, but the small upright one become diffuse and indefinite over a given point, it indicates opacity on the front of the capsule of the lens. If both upright images remain clear while the inverted one becomes indistinct at a given point, then the opacity is in the substance of the lens itself or in the posterior part of its capsule.

If in a given case the pupil remains so closely contracted that the deeper parts of the eye can not be seen, the eyelids may be rubbed with extract of belladonna, and in a short time the pupil will be found widely dilated.

DISEASES OF THE EYELIDS.

Congenital Disorders.—Some faulty conditions of the eyelids are congenital, as division of an eyelid in two, after the manner of hare-lip, abnormally small opening between the lids, often connected with imperfect development of the eye, and closure of the lids by adhesion. The first is to be remedied by paring the edges of the division and then bringing them together, as in torn lids. The last two, if remediable at all, require separation by the knife, and subsequent treatment with a cooling astringent eyewash.

Nervous Disorders.—Spasm of eyelids may be owing to constitutional susceptibility, or to the presence of local irritants (insects, chemical irritants, sand, etc.) in the eye, to wounds or inflammation of the mucous membrane, or to disease of the brain. When due to local irritation, it may be temporarily overcome by instilling a few drops of a 4 per cent solution of cocaine into the eye, when the true cause may be ascertained and removed. The nervous or constitutional disease must be treated according to its nature.

Drooping Eyelids, or Ptosis.—This is usually present in the upper lid, or is at least little noticed in the lower. It is sometimes but a symptom of paralysis of one-half of the face, in which case the ear, lips, and nostrils on the same side will be found soft, drooping, and inactive, and even the half of the tongue may partake of the palsy. If the same condition exists on both sides, there is difficult snuffling breathing, from the air drawing in the flaps of the nostrils in inspiration, and all food is taken in by the teeth, as the lips are useless. In both there is a free discharge of saliva from the mouth during mastication. This paralysis is a frequent result of injury, by a poke, to the seventh nerve, as it passes over the back of the lower jaw. In some cases the paralysis is confined to the lid, the injury having been sustained by the muscles which raise it, or by the supraorbital nerve which emerges from the bone just above the eye. Such injury to the nerve may have resulted from fracture of the orbital process of the frontal bone above the eyeball.

The condition may, however, be due to spasm of the sphincter muscle, which closes the lids, or to inflammation of the upper lid, usually a result of blows on the orbit. In the latter case it may run a slow course with chronic thickening of the lid.

The paralysis due to the poke may be often remedied, first, by the removal of any remaining inflammation by a wet sponge worn beneath the ear and kept in place by a bandage; second, when all inflammation has passed, by a blister on the same region, or by rubbing it daily with a mixture in equal proportions of olive oil and strong aqua ammonia. Improvement is usually slow, and it may be months before complete recovery ensues. In paralysis from blows above the eyes the same treatment may be applied to that part. Thickening of the lid may be treated by painting with tincture of iodine, and that failing, by cutting out an elliptical strip of the skin from the middle of the upper lid and stitching the edges together.

INFLAMMATION OF THE EYELIDS.

The eyelids suffer more or less in all severe inflammations of the eye, whether external or internal, but inasmuch as the disease sometimes starts in the lids and at other times is exclusively confined to them, it deserves independent mention.

Among the causes may be named: Exposure to drafts of cold air or to cold rain or snow storms; the bites or stings of mosquitoes, flies, and other insects; snake bites, pricks with thorns, blows of whip or club; accidental bruises against the stall or ground, especially during the violent struggles of colic, staggers, and when thrown for operations. It is also a result of infecting inoculations, as of erysipelas, anthrax, boil, etc., and is noted as being especially prevalent among horses kept on low marshy pastures. Finally, the introduction of sand, dust, chaff, beards of barley and seeds of the finest grasses, and the contact with irritant chemical powders, liquids, and gases (ammonia from manure or factory, chlorine, strong sulphur fumes, smoke, and other products of combustion, etc.) may start the inflammation. The eyelids often undergo extreme inflammatory and dropsical swelling in urticaria (nettlerash, surfeit) and in the general inflammatory dropsy known as purpura hemorrhagica.

The affection will, therefore, readily divide itself into (1) inflammations due to constitutional causes; (2) those due to direct injury, mechanical or chemical; and (3) such as are due to inoculation with infecting material.

(1) Inflammations due to constitutional causes are distinguished by the absence of any local wound, and the history of a low, damp pasture, exposure, indigestion from unwholesome food, or the presence elsewhere on the limbs or body of the general doughy swellings of purpura hemorrhagica. The lids are swollen and thickened; it may be slightly or it may be so extremely that the eyeball can not be seen. If the lid can be everted to show its mucous membrane, that is seen to be of a deep-red color, especially along the branching lines of the blood vessels. The part is hot and painful, and a profuse flow of tears and mucus escapes on the side of the face, causing irritation and loss of the hair. If improvement follows, this discharge becomes more tenacious, and tends to cause adhesion to the edges of the upper and lower lids and to mat together the eyelashes in bundles. This gradually decreases to the natural amount, and the redness and congested appearance of the eye disappears, but swelling, thickening, and stiffness of the lids may continue for a length of time. There may be more or less fever according to the violence of the inflammation, but so long as there is no serious disease of the interior of the eye or of other vital organ this is usually moderate.

The local treatment consists in astringent, soothing lotions (sugar of lead 30 grains, laudanum 2 teaspoonfuls, rain water—boiled and cooled—1 pint), applied with a soft cloth kept wet with the lotion, and hung over the eye by tying it to the headstall of the bridle on the two sides. If the mucous membrane lining of the lids is the seat of little red granular elevations, a drop of solution of 2 grains of nitrate of silver in an ounce of distilled water should be applied with the soft end of a clean feather to the inside of the lid twice a day. The patient should be removed from all such conditions (pasture, faulty food, exposure, etc.) as may have caused or aggravated the disease, and from dust and irritant fumes and gases. He should be fed from a manger high enough to favor the return of blood from the head, and should be kept from work, especially in a tight collar which would prevent the descent of blood by the jugular veins. His diet should be laxative and nonstimulating (grass, bran mashes, carrots, turnips, beets, potatoes, or steamed hay), and any costiveness should be corrected by a mild dose of raw linseed oil (1 to 1½ pints). In cold weather warm blanketing may be needful, and even loose flannel bandages to the limbs, but heat should never be sought at the expense of pure air.

(2) In inflammations due to local irritants a careful examination will usually reveal their presence, and the first step must be their removal with a pair of blunt forceps or the point of a lead pencil. Subsequent treatment will be in the main the local treatment advised above.

(3) In case of infective inflammation there will often be found a prick or tear by which the septic matter has entered, and in such case the inflammation will for a time be concentrated at that point. A round or conical swelling around an insect bite is especially characteristic. A snake bite is marked by the double prick made by the two teeth and by the violent and rapidly spreading inflammation. Erysipelas is attended with much swelling, extending beyond the lids and causing the mucous membrane to protrude beyond the edge of the eyelid. This is characterized by a bright, uniform, rosy red, disappearing on pressure, or later by a dark, livid hue, but with less branching redness than in noninfecting inflammation and less of the dark, dusky, brownish or yellowish tint of anthrax. Little vesicles may appear on the skin, and pus may be found without any distinct limiting membrane, as in abscess. It is early attended by high fever and marked general weakness and inappetence. Anthrax of the lids is marked by a firm swelling, surmounted by a blister, with bloody serous contents, which tends to burst and dry up into a slough, while the surrounding parts become involved in the same way. Or it may show as a diffuse dropsical swelling, with less of the hard central sloughing nodule, but, like that, tending to spread quickly. In both cases alike the mucous membrane and the skin, if white, assume a dusky brown or yellowish brown hue, which is largely characteristic. This may pass into a black color by reason of extravasation of blood. There appears early great constitutional disturbance, with much prostration and weakness and generalized anthrax symptoms.

Treatment.—The treatment of these will vary according to the severity. Insect bites may be touched with a solution of equal parts of glycerin and aqua ammonia, or a 10 per cent solution of carbolic acid in water. Snake bites may be bathed with aqua ammonia, and the same agent given in doses of 2 teaspoonfuls in a quart of water. Or alcohol may be given in pint or quart doses, according to the size of the animal. In erysipelas the skin may be painted with a solution of 20 grains of iodine in an ounce of carbolic acid, and one-half an ounce of tincture of muriate of iron may be given thrice daily in a bottle of water. In anthrax the swelling should be painted with tincture of iodine, or of the mixture of iodine and carbolic acid, and if very threatening it may have the tincture of iodine injected into the swelling with a hypodermic syringe, or the hard mass may be freely incised to its depth with a sharp lancet and the lotion applied to the exposed tissues.

STY, OR FURUNCLE (BOIL) OF THE EYELID.

This is an inflammation of limited extent, advancing to the formation of matter and the sloughing out of a small mass of the natural tissue of the eyelid. It forms a firm, rounded swelling, usually near the margin of the lid, which suppurates and bursts in four or five days. Its course may be hastened by a poultice of camomile flowers, to which have been added a few drops of carbolic acid, the whole applied in a very thin muslin bag. If the swelling is slow to open after having become yellowish white, it may be opened by a lancet, the incision being made at right angles to the margin of the lid.

ENTROPION AND ECTROPION, OR INVERSION AND EVERSION OF THE EYELID.

These are respectively caused by wounds, sloughs, ulcers, or other causes of loss of substance of the mucous membrane on the inside of the lid and of the skin on the outside; also of tumors, skin diseases, or paralysis which leads to displacement of the margin of the eyelid. As a rule, they require a surgical operation, with removal of an elliptical portion of the mucous membrane or skin, as the case may be, but which requires the skilled and delicate hand of the surgeon.

TRICHIASIS.

This consists in the turning in of the eyelashes so as to irritate the front of the eye. If a single eyelash, it may be snipped off with scissors close to the margin of the eyelid or pulled out by the root with a pair of flat-bladed forceps. If the divergent lashes are more numerous, the treatment may be as for entropion, by excising an elliptical portion of skin opposite the offending lashes and stitching the edges together, so as to draw outward the margin of the lid at that point.

WARTS AND OTHER TUMORS OF THE EYELIDS.

The eyelids form a favorite site for tumors, and above all, warts, which consist in a simple diseased overgrowth of the surface layers of the skin. If small, these may be snipped off with scissors or tied around the neck with a stout waxed thread and left to drop off, the destruction being completed, if necessary, by the daily application of blue vitriol, until any unhealthy material has been removed. If more widely spread, the wart may still be clipped off with curved scissors or knife, and the caustic thoroughly applied day by day.

A bleeding wart, or erectile tumor, is more liable to bleed, and is best removed by constricting its neck with the waxed cord or rubber band, or if too broad for this it may be transfixed through its base by a needle armed with a double thread, which is then to be cut in and tied around the two portions of the neck of the tumor. If still broader, the armed needle may be carried through the base of the tumor at regular intervals, so that the whole may be tied in moderately sized sections.

TORN EYELIDS OR WOUNDS OF EYELIDS.

The eyelids are torn by attacks with horns of cattle, or with the teeth; or by getting caught on nails in stall, rack, or manger, on the point of stumps, fences, or fence rails, on the barbs of wire fences, and on other pointed bodies. The edges should be brought together as promptly as possible, so as to secure union without the formation of matter, puckering of the skin, and unsightly distortions. Great care is necessary to bring the two edges together evenly without twisting or puckering. The simplest mode of holding them together is by a series of sharp pins passed through the lips of the wound at intervals of not over a third of an inch, and held together by a thread twisted around each pin in the form of the figure 8, and carried obliquely from pin to pin in two directions, so as to prevent gaping of the wound in the intervals. The points of the pins may then be cut off with scissors, and the wound may be wet twice a day with a weak solution of carbolic acid.

OBSTRUCTION OF THE LACHRYMAL APPARATUS, OR WATERING EYE.

The escape of tears on the side of the cheek is a symptom of external inflammation of the eye, but it may also occur from any disease of the lachrymal apparatus which interferes with the normal progress of the tears to the nose. Hence, in all cases when this symptom is not attended by special redness or swelling of the eyelids, it is well to examine the lachrymal apparatus. In some instances the orifice of the lachrymal duct on the floor of the nasal chamber and close to its anterior outlet will be found blocked by a portion of dry mucopurulent matter, on the removal of which tears may begin to escape. This implies an inflammation of the canal, which may be helped by occasional sponging out of the nose with warm water, and the application of the same on the face. Another remedy is to feed warm mashes of wheat bran from a nosebag, so that the relaxing effects of the water vapor may be secured.

EXTERNAL OPHTHALMIA, OR CONJUNCTIVITIS.

In inflammation of the outer parts of the eyeball the exposed vascular and sensitive mucous membrane which covers the ball, the eyelids, the haw, and the lachrymal apparatus, is usually the most deeply involved, yet adjacent parts are more or less implicated, and when disease is concentrated on these contiguous parts it constitutes a phase of external ophthalmia which demands a special notice. These have accordingly been already treated of.

Causes.—The causes of external ophthalmia are mainly those that act locally—blows with whips, clubs, and twigs, the presence of foreign bodies like hay seed, chaff, dust, lime, sand, snuff, pollen of plants, flies attracted by the brilliancy of the eye, wounds of the bridle, the migration of mange insect into the eye, smoke, ammonia rising from the excretions, irritant emanations from drying marshes, etc. Road dust containing infecting microbes is a common factor. A very dry air is alleged to act injuriously by drying the eye as well as by favoring the production of irritant dust; and the undue exposure to bright sunshine through a window in front of the stall, or to the reflection from snow or water, is undoubtedly injurious. The unprotected exposure of the eyes to sunshine through the use of a very short overdraw check is to be condemned, and the keeping of the horse in a very dark stall from which it is habitually led into the glare of full sunlight, intensified by reflection from snow or white limestone dust, must be set down among the locally acting causes. But exposure to cold and wet, to wet and snow storms, to cold drafts and wet lairs must also be accepted as causes of conjunctivitis, the general disorder which they produce affecting the eye, if that happens to be the weakest and most susceptible organ of the body, or if it has been subjected to any special local injury, like dust, irritant gases, or excess of light. Again, external ophthalmia is a constant concomitant of inflammation of the contiguous and continuous mucous membranes, as those of the nose and throat. Hence the red, watery eyes that attend on nasal catarrh, sore throat, influenza, strangles, nasal glanders, and the like. In such cases, however, the affection of the eye is subsidiary and is manifestly overshadowed by the primary and predominating disease.

Symptoms.—The symptoms are watering of the eyes, swollen lids, redness of the mucous membrane exposed by the separation of the lids—it may be a mere pink blush with more or less branching redness, or it may be a deep, dark red, as from effusion of blood—and a bluish opacity of the cornea, which is normally clear and translucent. But except when resulting from wounds and actual extravasation of blood, the redness is seen to be superficial, and if the opacity is confined to the edges, and does not involve the entire cornea, the aqueous humor behind is seen to be still clear and limpid. The fever is always less severe than in internal ophthalmia, and only runs high in the worst cases. The eyelids may be kept closed, the eyeball retracted, and the haw protruded over one-third or one-half of the ball, but this is due to the pain only and not to any excessive sensibility to light, as shown by the comparatively widely dilated pupil. In internal ophthalmia, on the contrary, the narrow contracted pupil is the measure of the pain caused by the falling of light on the inflamed and sensitive optic nerve (retina) and choroid.

If the affection has resulted from a wound of the cornea, not only is that the point of greatest opacity, forming a white speck or fleecy cloud, but too often blood vessels begin to extend from the adjacent vascular covering of the eye (sclerotic) to the white spot, and that portion of the cornea is rendered permanently opaque. Again, if the wound has been severe, though still short of cutting into the anterior layers of the cornea, the injury may lead to ulceration that may penetrate more or less deeply and leave a breach in the tissue which, if filled up at all, is repaired by opaque fibrous tissue in place of the transparent cellular structure. Pus may form, and the cornea assumes a yellowish tinge and bursts, giving rise to a deep sore which is liable to extend as an ulcer, and may be in its turn followed by bulging of the cornea at that point. This inflammation of the conjunctiva may be simply catarrhal, with profuse muco-purulent discharge; it may be granular, the surface being covered with minute reddish elevations, or it may become the seat of a false membrane.

Treatment.—In treating external ophthalmia the first object is the removal of the cause. Remove any dust, chaff, thorn, or other foreign body from the conjunctiva, purify the stable from all sources of ammoniacal or other irritant gas; keep the horse from dusty roads, and, above all, from the proximity of a leading wagon and its attendant cloud of dust; remove from pasture and feed from a rack which is neither so high as to drop seeds, etc., into the eyes nor so low as to favor the accumulation of blood in the head; avoid equally excess of light from a sunny window in front of the stall and excess of darkness from the absence of windows; preserve from cold drafts and rains and wet bedding, and apply curative measures for inflammation of the adjacent mucous membranes or skin. If the irritant has been of a caustic nature, remove any remnant of it by persistent bathing with tepid water and a soft sponge, or with water mixed with white of egg, or a glass filled with the liquid may be inverted over the eye so that its contents may dilute and remove the irritant. If the suffering is very severe, a lotion with a few grains of extract of belladonna or of morphia in an ounce of water may be applied, or if it is available, a few drops of 4 per cent solution of cocaine may be instilled into the eye.

In strong, vigorous patients benefit will usually be obtained from a laxative, such as 2 tablespoonfuls of Glauber's salts daily, and if the fever runs high from a daily dose of half an ounce of saltpeter. As local applications astringent solutions are usually the best, as 30 grains of borax or of sulphate of zinc in a quart of water, to be applied constantly on a cloth, as advised under "Inflammation of the eyelids." In the absence of anything better, cold water may serve every purpose. Above all, adhesive and oily agents (molasses, sugar, fats) are to be avoided, as only adding to the irritation. By way of suggesting agents that may be used with good effect, salt and sulphate of soda may be named, in solutions double the strength of sulphate of zinc, or 7 grains of nitrate of silver may be added to a quart of distilled water, and will be found especially applicable in granular conjunctivitis, diphtheria, or commencing ulceration. A cantharides blister (1 part of Spanish fly to 4 parts lard) may be rubbed on the side of the face 3 inches below the eye, and washed off next morning with soapsuds and oiled daily till the scabs are dropped.

WHITE SPECKS AND CLOUDINESS OF THE CORNEA.

As a result of external ophthalmia, opaque specks, clouds, or haziness are too often left on the cornea and require for their removal that they be daily touched with a soft feather dipped in a solution of 3 grains nitrate of silver in 1 ounce distilled water. This should be applied until all inflammation has subsided, and until its contact is comparatively painless. It is rarely successful with an old thick scar following an ulcer, nor with an opacity having red blood vessels running across it.

ULCERS OF THE CORNEA.

These may be treated with nitrate of silver lotion of twice the strength used for opacities. Powdered gentian, one-half ounce, and sulphate of iron, one-fourth ounce daily, may improve the general health.

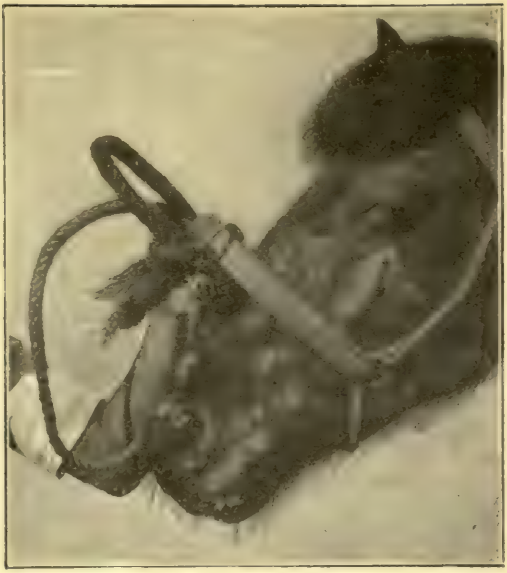
INTERNAL OPHTHALMIA (IRITIS, CHOROIDITIS, AND RETINITIS).

Although inflammations of the iris, choroid, and retina—the inner, vascular, and nervous coats of the eye—occur to a certain extent independently of each other, yet one usually supervenes upon the other, and, as the symptoms are thus made to coincide, it will be best for our present purposes to treat the three as one disease.

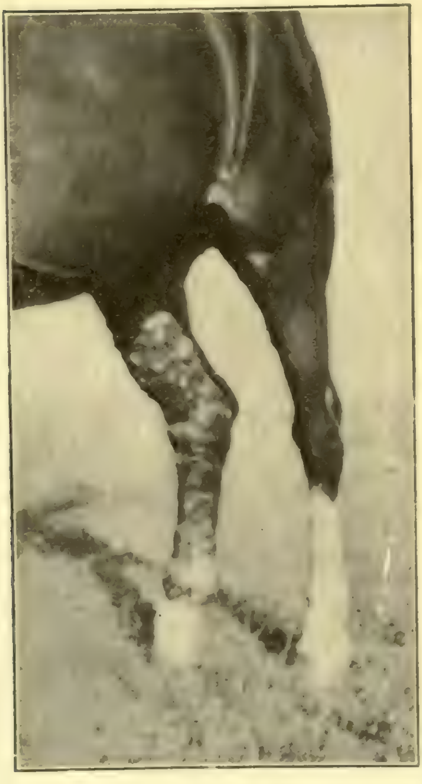
Causes.—The causes of internal ophthalmia are largely those of the external form only, acting with greater intensity or on a more susceptible eye. Severe blows, bruises, punctures, etc., of the eye, the penetration of foreign bodies into the eye (thorns, splinters of iron, etc.), sudden transition from a dark stall to bright sunshine, to the glare of snow or water, constant glare from a sunny window, abuse of the overdraw checkrein, vivid lightning flashes, drafts of cold. damp air; above all, when the animal is perspiring, exposure in cold rain and snow storms, swimming cold rivers; also certain general diseases like rheumatism, anthritis, influenza, and disorders of the digestive organs, may become complicated by this affection. From the close relation between the brain and eye—alike in the blood vessels and nerves—disorders of the first lead to affections of the second, and the same remark applies to the persistent irritation to which the jaws are subjected in the course of dentition. So potent is the last agency that we dread a recurrence of ophthalmia so long as dentition is incomplete, and hope for immunity if the animal completes its dentition without any permanent structural change in the eye.

Symptoms.—The symptoms will vary according to the cause. If the attack is due to direct physical injury, the inflammation of the eyelids and superficial structures may be quite as marked as that of the interior of the eye. If, on the other hand, from general causes, or as a complication of some distant disease, the affection may be largely confined to the deeper structures and the swelling, redness and tenderness of the superficial structures will be less marked.

Treatment.—The treatment of internal ophthalmia should embrace, first, the removal of all existing causes or sources of aggravation of the disease, which need not be here repeated. Special care to protect the patient against cold, wet, strong light, and active exertion must, however, be insisted on. A dark stall and a cloth hung



Mycotic Lymphangitis in Pony.
Dept. of Agr.



Mycotic Lymphangitis in Mare.
Dept. of Agr.

over the eye are important, while cleanliness, warmth, dryness, and rest are equally demanded. If the patient is strong and vigorous, a dose of 4 drams of Barbados aloes may be given, and, if there is any reason to suspect a rheumatic origin, one-half a dram powdered colchicum and one-half ounce salicylate of soda may be given daily. Locally, the astringent lotions advised for external ophthalmia may be resorted to, especially when the superficial inflammation is well marked. More important, however, is to instill into the eye, a few drops at a time, a solution of 4 grains of atropia in 1 ounce of distilled water. This may be effected with the aid of a soft feather, and may be repeated at intervals of ten minutes until the pupil is widely dilated. As the horse is to be kept in a dark stall, the consequent admission of light will be harmless, and the dilation of the pupil prevents adhesion between the iris and lens, relieves the constant tension of the eye in the effort to adapt the pupil to the light, and solicits the contraction of the blood vessels of the eye and the lessening of congestion. Should atropia not agree with the case, it may be replaced by cocaine in 4 per cent solution. Another local measure is a blister, which can usually be applied to advantage on the side of the nose or beneath the ear. Spanish flies may be used as for external ophthalmia. In very severe cases the parts beneath the eye may be shaved and three or four leeches applied. Setons are sometimes beneficial, and even puncture of the eyeball, but these should be reserved for professional hands. The diet throughout should be easily digestible and moderate in quantity—bran mash, middlings, grass, steamed hay, etc.

Even after the active inflammation has subsided the atropia lotion should be continued for some weeks to keep the eye in a state of rest in its still weak and irritable condition, and during this period the patient should be kept in semi-darkness, or taken out only with a dark shade over the eye. For the same reason heavy drafts and rapid paces, which would cause congestion of the head, should be carefully avoided.

RECURRENT OPHTHALMIA (PERIODIC OPHTHALMIA, OR MOON-BLINDNESS).

This is an inflammatory affection of the interior of the eye, intimately related to certain soils, climates, and systems, showing a strong tendency to recur again and again, and usually ending in blindness from cataract or other serious injury.

Causes.—Its causes may be fundamentally attributed to soil. On damp clays and marshy grounds, on the frequently overflowed river bottoms and deltas, on the coasts of seas and lakes alternately submerged and exposed, this disease prevails extensively. Other influences, more or less associated with such soil, are potent causative factors. Thus damp air and a cloudy, wet climate, so constantly associated with wet lands, are universally charged with causing the disease. These act on the animal body to produce a lymphatic constitution with an excess of connective tissue, bones, and muscles of coarse open texture, thick skins and gummy legs covered with a profusion of long hair.

The rank aqueous fodders grown on such soils are other causes, but these again are calculated to undermine the character of the nervous and sanguineous temperament, and to superinduce the lymphatic. Other foods act by leading to constipation and other disorders of the digestive organs, thus impairing the general health; hence in any animal predisposed to this disease, heating, starchy foods, such as maize, wheat, and buckwheat, are to be carefully avoided. It has been widely charged that beans, peas, and vetches are dangerous, but a fuller inquiry contradicts this. If these are well grown they invigorate and fortify the system, while, like any other fodder, if grown rank, aqueous, and deficient in assimilable principles, they tend to lower the health and open the way for the disease.

The period of dentition and training is a fertile exciting cause, for though the malady may appear at any time from birth to old age, yet the great majority of victims are from two to six years old, and if a horse escapes the affection till after six there is a reasonable hope that he will continue to resist it. The irritation about the head during the eruption of the teeth, and while fretting in the unwonted bridle and collar, the stimulating grain diet and the close air of the stable all combine to rouse the latent tendency to disease in the eye, while direct injuries by bridle, whip, or hay seeds are not without their influence. In the same way local irritants, like dust, severe rain and snow storms, smoke, and acrid vapors are contributing causes.

It is evident, however, that no one of these is sufficient of itself to produce the disease, and it has been alleged that the true cause is a microbe, or the irritant products of a microbe, which is harbored in the marshy soil. The prevalence of the disease on the same damp soils which produce ague in man and anthrax in cattle has been quoted in support of this doctrine, as also the fact that the malady is always more prevalent, other things being equal, in basins surrounded by hills where the air is still and such products are concentrated, and that a forest or simple belt of trees will, as in ague, at times limit the area of its prevalence. Another argument for the same view is found in the fact that on certain farms irrigated by town sewage this malady has become extremely prevalent, the sewage being assumed to form a suitable nidus for the growth of the germ. But on these sewage farms a fresh crop may be cut every fortnight, and the product is precisely that aqueous material which contributes to a lymphatic structure and a low tone of health. The presence in the system of a definite germ has not yet been proven, and in the present state of our knowledge we are only warranted in charging the disease to the deleterious emanations from the marshy soil in which bacterial ferments are constantly producing them.

Heredity is one of the most potent causes. This is notorious in the case of both parents, male and female. The tendency appears to be stronger, however, if either parent has already suffered. Thus a mare may have borne a number of sound foals, and then fallen a victim to this malady, and all foals subsequently born have likewise suffered. So with the stallion. Reynal even quotes the appearance of the disease in alternate generations, the stallion offspring of blind parents remaining sound through life and yet producing foals which furnish numerous victims of recurrent ophthalmia. On the contrary, the offspring of diseased parents removed to high, dry regions and furnished with wholesome, nourishing rations will nearly all escape.

Yet the hereditary taint is so strong and pernicious that intelligent horsemen everywhere refuse to breed from either horse or mare that has once suffered from recurrent ophthalmia, and the French Government studs not only reject all unsound stallions, but refuse service to any mare which has suffered with her eyes. It is this avoidance of the hereditary predisposition more than anything else that has reduced the formerly wide prevalence of this disease in the European countries generally. A consideration for the future of our horses would demand the disuse of all sires that are unlicensed, and the refusal of a license to any sire which has suffered from this or any other communicable constitutional disease.

Other contributing causes deserve passing mention. Unwholesome food and a faulty method of feeding undoubtedly predisposes to the disease, and in the same district the carefully fed will escape in far larger proportion than the badly fed. But it is so with every other condition which undermines the general health. The presence of worms in the intestines, overwork, and debilitating diseases and causes of every kind weaken the vitality and lay the system more open to attack. Thierry long ago showed that the improvement of close, low, dark, damp stables, where the disease had previously prevailed, practically banished this affection. Whatever contributes to strength and vigor is protective; whatever contributes to weakness and poor health is provocative of the disease in the predisposed subject.

Symptoms.—The symptoms vary according to the severity of the attack. In some cases there is marked fever, and in some slighter cases this may be almost altogether wanting, but there is always a lack of vigor and energy, bespeaking general disorder. The local symptoms are in the main those of internal ophthalmia, with, in many cases, an increased hardness of the eyeball from effusion into its cavity. The contracted pupil does not expand much in darkness, nor even under the action of belladonna. Opacity advances from the margin, over a part or whole of the cornea, but so long as it is transparent there may be seen the turbid, aqueous humor with or without flocculi, the dingy iris robbed of its clear black aspect, the slightly clouded lens and a greenish yellow reflection from the depth of the eye. From the fifth to the seventh day the flocculi precipitate in the lower part of the chamber, exposing more clearly the iris and lens, and absorption commences, so that the eye may be cleared up in ten or fifteen days.

The characteristic of the disease is, however, its recurrence again and again in the same eye until blindness results. The attacks may follow each other at intervals of a month, more or less, but they show no relation to any particular phase of the moon as might be inferred from the familiar name, but are determined rather by the weather, the health, the food, or by some periodicity of the system. From five to seven attacks usually result in blindness, and then the second eye is liable to be attacked until it also is ruined.

Prevention.—The prevention of this disease is the great object to be aimed at, and this demands the most careful breeding, feeding, housing, and general management, as indicated under "Causes." Much can also be done by migration to a high, dry location, but for this and malarious affections the improvement of the land by drainage and good cultivation should be the final aim.

Treatment is not satisfactory, but is largely the same as for common internal ophthalmia. Some cases, like rheumatism, are benefited by scruple doses of powdered colchicum and 2-dram doses of salicylate of soda twice a day. In other cases, with marked hardness of the globe of the eye from introcular effusion, aseptic puncture of the eye, or even the excision of a portion of the iris, has helped. During recovery a course of tonics (2 drams oxide of iron, 10 grains nux vomica, and 1 ounce sulphate of soda daily) is desirable to invigorate the system and help to ward off another attack. The vulgar resort to knocking out the wolf teeth and cutting out the haw can only be condemned. The temporary recovery would take place in one or two weeks, though no such thing had been done, and the breaking of a small tooth, leaving its fang in the jaw, only increases the irritation.

CATARACT.

The common result of internal ophthalmia, as of the recurrent type, may be recognized as described under the first of these diseases. Its offensive appearance may be obviated by extraction or depression of the lens, but as the rays of light would no longer be properly refracted, perfect vision would not be restored, and the animal would be liable to prove an inveterate shyer. If perfect blindness continued by reason of pressure on the nerve of sight, no shying would result.

PALSY OF THE NERVE OF SIGHT, OR AMAUROSIS.

Causes.—The causes of this affection are tumors or other disease of the brain implicating the roots of the optic nerve, injury to the nerve between the brain and eye, and inflammation of the optic nerve within the eye (retina), or undue pressure on the same from dropsical or inflammatory effusion. It may also occur from overloaded stomach, from a profuse bleeding, and even from the pressure of the gravid womb in gestation.

Symptoms.—The symptoms are wide dilatation of the pupils, so as to expose fully the interior of the globe, the expansion remaining the same in light and darkness. Ordinary eyes when brought to the light have the pupils suddenly contract, and then dilate and contract alternately until they adapt themselves to the amount of light. The horse does not swerve when a feint to strike is made unless the hand causes a current of air. The ears are held erect and turn quickly toward any noise, and the horse steps high to avoid stumbling over objects which it can not see.

Treatment is only useful when the disease is symptomatic of some removable cause, like congested brain, loaded stomach, or gravid womb. When recovery does not follow the termination of these conditions, apply a blister behind the ear and give one-half dram doses of nux vomica daily.

TUMORS OF THE EYEBALL.

A variety of tumors attack the eyeball—dermoid, papillary, fatty, cystic, and melanotic—but perhaps the most frequent in the horse is encephaloid cancer. This may grow in or on the globe, the haw, the eyelid, or the bones of the orbit, and is only to be remedied, if at all, by early and thorough excision. It may be distinguished from the less dangerous tumors by its softness, friability, and great vascularity, bleeding on the slightest touch, as well as by its anatomical structure.—(Spl. Rpt. Horse Dept. Agr. 1911.)

DISEASES OF THE HEART, BLOOD VESSELS, AND LYMPHATICS.

DISEASES OF THE HEART AND BLOOD VESSELS.

In considering diseases of the heart we meet with many difficulties, depending much upon the position which this organ occupies in the animal. The shoulders cover so much of the anterior portion of the chest, and often in very heavy-muscled horses the chest walls are so thick that a satisfactory examination of the heart is attended with difficulty. Diseases of the heart are not uncommon among horses; the heart and its membranes are frequently involved in diseases of the respiratory organs, diseases of the kidneys, rheumatism, influenza, etc. Some of the diseases of this organ are never suspected by the ordinary observer during life, and are so difficult to diagnose with any degree of certainty that we will have to confine ourselves to a general outline, giving attention to such symptoms as may serve to lead to a knowledge of their existence, with directions for treatment, care, etc.

Nervous affections often produce prominent heart symptoms by causing functional disturbance of that organ, which, if removed, will leave the heart restored to perfect vigor and normal action. Organic changes involving the heart or valves, however, usually grow worse and eventually prove fatal. Therefore it is necessary that we arrive at an appreciation of the true nature and causes, so that we may be able to form a true estimate of the possibilities for recovery or encouragement for medical treatment.

Disease of the heart may occur at any age, but it is witnessed most frequently in young horses, which, when being trained for fast work, are often subjected to excessive hardship and fatigue. Nervous or timid animals also suffer from such diseases more frequently than those of a sluggish disposition. Any cause which induces a violent or sudden change in the circulation may result in injury to the heart. Symptoms which may frequently denote disease of the heart are difficult breathing or short-windedness, dropsies of the limbs, habitual coldness of the extremities, giddiness or fainting attacks, inability to stand work, although the general appearance would indicate strength and ability, etc.

INFLAMMATORY DISEASES OF THE HEART.

This will embrace myocarditis, endocarditis, and pericarditis.

MYOCARDITIS, OR INFLAMMATION OF THE MUSCULAR STRUCTURE OF THE HEART.

The heart muscle sometimes becomes inflamed as a complication or result of the existence of general or febrile and of infectious diseases. Severe influenza or infectious pneumonia is not infrequently followed by myocarditis. By extension of inflammation of the endocardium or pericardium the muscle of the heart may become involved. Over-exertion or especially hard work continued for a long time may cause this muscle to become inflamed.

Symptoms.—Inflammation of the heart muscle is shown by inability to contract forcibly; this results in a rapid but weak, soft pulse and irregular heart sounds. The pulse may be quite irregular as a result of the irregular, tumultuous action of the heart. There is great general weakness, shortness of breath, and rapid respiratory movements. In some cases, where the muscle is very much softened and weakened, or, perhaps when an abscess forms in the wall of the heart, the course of the disease is very rapid and terminates suddenly from paralysis or rupture of the heart.

Treatment.—In this disease the nutrition and strength of the heart should be kept up as much as possible with good food, good care, and heart tonics and stimulants. The horse should be tempted to eat such foods as he will take; he should be kept in an airy box stall; his legs should be well rubbed as often as necessary to keep them warm and bandaged loosely with flannel bandages. Internally, the horse may have strychnia in 2-grain doses twice daily, whisky in 4-ounce doses every two to four hours, digitalis in the form of the tincture in doses of 1 dram every three to six hours. Artificial Carlsbad salts in heaping tablespoonful doses in the feed may be given three times daily for a couple of weeks. Rest is of the greatest importance and should be allowed for a few weeks after recovery seems to be complete.

ENDOCARDITIS, OR INFLAMMATION OF THE LINING MEMBRANE OF THE HEART, USUALLY INVOLVING THE MUSCULAR STRUCTURE.

Endocarditis frequently occurs as a complication of rheumatism, some of the specific or zymotic fevers, specific poisoning, etc. This is a more frequent disease among horses than is generally known, and often gives rise to symptoms which, at first, are obscure and unnoticed.

Endocarditis may be acute, subacute, or chronic. In acute inflammation we find a thickening and a roughened appearance of the endocardium throughout the cavities of the heart. This condition may be followed by a coagulation of fibrin upon the inflamed surface, which adheres to it, and by attrition soon becomes worked up into shreddy-like granular elevations; this may lead to a formation of fibrinous clots in the heart and sudden death early in the disease, the second or third day.

Subacute endocarditis, which is the most common form, may not become appreciable for several days after its commencement. It is characterized by being confined to one or more anatomical divisions of the heart, and all the successive morbid changes follow each other in a comparatively slow process. Often we would not be led to suspect heart affection were it not for the distress in breathing, which it generally occasions when the animal is exercised, especially if the valves are much involved. When coagula or vegetations form upon the inflamed membrane, either in minute shreds or patches, or when formation of fibrinous clots occurs in the cavity affected, some of these materials may be carried from the cavity of the heart by the blood current into remote organs, constituting emboli that are liable to suddenly plug vessels and thereby interrupt important functions. In the great majority of either acute or subacute grades of endocarditis, whatever the exciting cause, the most alarming symptoms disappear in a week or ten days, often leaving, however, such changes in the interior lining or valvular structures as to cause impairment in the circulation for a much longer period of time. These changes usually consist of thickening of the inflamed structures. But while the effects of the inflammation in the membrane lining the walls of the ventricles may subside to such a degree as to cause little or no inconvenience, or even wholly disappear, yet after the valvular structures have been involved, causing them to be thicker, less flexible than normal, they usually remain, obstructing the free passage of the blood through the openings of the heart, thereby inducing secondary changes, which take place slowly at first, but ultimately seriously impair the animal's usefulness.

Endocardial inflammation is seldom fatal in its early stages, but in many cases the recovery is incomplete, for a large proportion is left with some permanent thickening of the valves, which constitutes the beginning of valvular disease.

Symptoms.—Endocarditis may be ushered in by a chill, with sudden and marked rise in temperature. The pulse rapidly decreases in strength or may become irregular, while the heart beats more or less tumultuously. In the early stages soft-blowing sounds may be heard by placing the ear over the heart on the left side, which correspond in number and rhythm to the heart's action. Excessive pain, though not so great as in acute pleuritis, is manifested when the animal is compelled to trot; very often difficulty in breathing, or shortness of breath, on the slightest exertion develops early in the attack. When the valves are involved in the inflammatory process the visible mucous membranes become either very pale or very dark colored, and fainting may occur when the head is suddenly elevated. When the valves of the right side are affected we may find a regurgitant pulsation in the jugular vein.

In fatal cases of endocarditis death often occurs about the fourth day, from the formation of heart clot or too great embarrassment of the circulation. Endocarditis may be suspected in all cases where plain symptoms of cardiac affection are manifested in animals affected with influenza, rheumatism, or any disease in which the blood may convey septic matter.

Acute endocardial inflammation may be distinguished from pleuritis by the absence of any friction murmur, absence of pain when the chest wall is percussed, and the absence of effusion in the cavity of the chest. It may be distinguished from pericarditis by the absence of the friction sounds and want of an enlarged area of dullness on percussion.

Treatment.—The objects to be attained by treatment will be to remove or mitigate as much as possible the cause inducing the disease; to find a medicine which will lessen the irritability of the heart without weakening it; and, last, to maintain a free urinary secretion and prevent exudation and hypertrophy. So long as there is an increase of temperature, with some degree of scantiness of the urine, it may be safe to believe that there is some degree of inflammatory action existing in the cardiac structures, and as long as any evidence of inflammatory action remains, however moderate in degree, there is a tendency to increase the connective tissue of the heart or valves, thereby rendering it almost certain that the structural changes will become permanent unless counteracted by persistent treatment and complete rest.

The tincture of digitalis, in 20-drop doses, repeated every hour, is perhaps the most reliable agent we know to control the irritability of the heart, and this also has a decided influence upon the urinary secretion. After the desired impression upon the heart is obtained the dose may be repeated every two or three hours, or as the case may demand. Bleeding, blistering, and stimulating applications to the chest should be avoided. They serve to irritate the animal and can do no possible good. Chlorate of potassa, in 2-dram doses, may be given in the drinking water every four hours for the first five or six days, and then be superseded by the nitrate of potassa, in half-ounce doses, for the following week, or until the urinary secretion becomes abnormally profuse. Where the disease is associated with rheumatism, 2-dram doses of salicylate of soda may be substituted for the chlorate of potassa. To guard against chronic induration of the valves, the iodide of potassa, in 1 to 2 dram doses, should be given early in the disease, and may be repeated two or three times a day for several weeks. When chronic effects remain after the acute stage has passed this drug becomes indispensable.

When dropsy of the limbs develops, it is due to weakened circulation or functional impairment of the kidneys. When there is much weakness in the action of the heart, or general debility is marked, the iodide of iron, in 1-dram doses, combined with hydrastis, 3 drams, may be given three times a day. Arsenic in five grain doses twice a day will give excellent results in some cases of weak heart associated with difficult breathing. In all cases absolute rest and warm stabling, with comfortable clothing, become necessary, and freedom from work should be allowed for a long time after all symptoms have disappeared.

PERICARDITIS, OR INFLAMMATION OF THE SAC INCLOSING THE HEART.

Causes.—Pericarditis may be induced by cold and damp stabling, exposure and fatigue, from wounds caused by broken ribs, etc.

Generally, however, it is associated with an attack of influenza, rheumatism, pleuritis, etc.

Symptoms.—Usually the disease manifests itself abruptly by a brief stage of chills coincident with pain in moving, a short painful cough, rapid and short breathing, and high temperature, with a rapid and hard pulse. In the early stages of the disease the pulse is regular in beat; later, when there is much exudation present in the pericardial sac, the heart-beat becomes muffled, and may be of a double or rebounding character. By placing the ear against the left side of the chest behind the elbow a rasping sound may be heard, corresponding to the frequency of the heart-beat. This is known as a friction sound. Between the second and fourth days this sound may disappear, due to a distension of the pericardium by an exudate or serous effusion. As soon as this effusion partly fills the pericardium, percussion will reveal an abnormally increased area of dullness over the region of the heart, the heart-beats become less perceptible than in health, and in some cases a splashing or flapping sound may become audible.

If the effusion becomes absorbed, the friction sound usually recurs for a short time; this friction may often be felt by applying the hand to the side of the chest. In a few cases spasms of the muscles of the neck may be present. In acute pericarditis, when the effusion is rapid and excessive, the animal may die in a few days or recovery may begin equally as early. In subacute or in chronic cases the effusion may slowly become augmented until the pressure upon the lungs and interference with the circulation becomes so great that death will result. Whether the attack is acute, subacute, or chronic, the characteristic symptoms which will guide us to a correct diagnosis are the friction sound, which is always synchronous with the heart's action, the high temperature with hard, irritable pulse, and, in cases of pericardial effusion, the increased area of dullness over the cardiac region. When the disease is associated with influenza or rheumatism, some of the symptoms may be obscure, but a careful examination will reveal sufficient evidence upon which to base a diagnosis. When pericarditis develops as a result of or in connection with pleuritis, the distinction may not be very clearly definable, neither will many recover. When it results from a wound or broken rib, it almost invariably proves fatal.

Pathology.—Pericarditis may at all times be regarded as a very serious affection. At first we will find an intense injection or accumulation of blood in the vessels of the pericardium, giving it a red and swollen appearance, during which we have the friction sound. In twenty-four to forty-eight hours this engorgement is followed by an exudation of sero-fibrinous fluid, the fibrinous portion of which may soon form a coating over the internal surface of the pericardial sac, and may ultimately form a union of the opposing surfaces. Generally this adhesion will only be found to occupy a portion of the surfaces. As the serous or watery portion of this effusion is absorbed, the distinctness of the friction sound recurs, and may remain perceptible in a varied degree for a long time.

When the serous effusion is very great, the pressure exerted upon the heart weakens its action, and may produce death soon; when it is not so great, it may cause dropsies of other portions of the body. When the adhesions of the pericardial sac to the body of the heart are extensive, they generally lead to increased growth, or hypertrophy, of the heart, with or without dilatation of its cavities; when they are but slight, they may not cause any inconvenience.

Treatment.—In acute or subacute pericarditis the tincture of digitalis may be given in 20 to 30 drop doses every hour until the pulse and temperature become reduced. Whisky or carbonate of ammonia may be given regularly as stimulants. Bandages should be applied to the legs; if the legs are very cold, tincture of capsicum should be first applied; the body should be warmly clothed in blankets, to promote perspiration. When the suffering from pain is very severe, 10 grains of morphine may be given by the mouth once or twice a day; nitrate of potassa, half an ounce, in drinking water, every six hours; after the third day, iodide of potassa, in 2-dram doses, may be substituted. Cold packs to the chest in the early stages of the disease may give marked relief, or, late in the disease, smart blisters may be applied to the sides of the chest with benefit. If the disease becomes chronic, iodide of iron and gentian to support the strength will be indicated, but the iodide of potassa, in 1 or 2 dram doses, two or three times a day, must not be abandoned so long as there is an evidence of effusion or plastic exudate accumulating in the pericardial sac. Where the effusion is great and threatens the life of the patient, tapping by an expert veterinarian may save the animal.

VALVULAR DISEASE OF THE HEART.

Acute valvular disease can not be distinguished from endocarditis, and chronic valvular affections are generally the result of endocardial inflammation. The valves of the left side are the most subject—the bicuspid or mitral and the aortic or semilunar. The derangement may consist of mere inflammation and swelling, or the edges of the valves may become covered by the organization of the exudation, thus narrowing the passage. Valvular obstruction and adhesions may occur or the tendinous cords may be lengthened or shortened, thus obstructing the orifices and permitting the regurgitation of blood. In protected cases the fibrous tissue of the valves may be transformed into fibro-cartilage or bone, or there may be deposits of salts of lime beneath the serous membrane, which may terminate in ulceration, rupture, or fissures. Sometimes the valves become covered by fibrinous, fleshy, or hard vegetations. In cases of considerable dilatation of the heart there may be shrinking of the valves.

Symptoms.—Valvular disease may be indicated by a venous pulse, jerking pulse, intermittent pulse, irregular pulse; palpitation; constant abnormal fullness of the jugular veins; difficulty of breathing when the animal becomes excited or is urged out of a walk or into a fast trot; attacks of vertigo; congestion of the brain; dropsical swelling of the limbs. A blowing, cooing, or bubbling murmur may sometimes be heard by placing the ear over the heart on the left side of the chest.

Treatment.—When the pulse is irregular or irritable, tonics, such as preparations of iron, gentian, and ginger, may be given. When the action of the heart is jerking or violent, 20 to 30 drop doses of tincture of digitalis or of veratrum viride may be given until these symptoms abate. As the disease nearly always is the result of endocarditis, the iodide of potassa and general tonics, sometimes stimulants, when general debility supervenes, may be of temporary benefit. Very few animals recover or remain useful for any length of time after once marked organic changes have taken place in the valvular structure of the heart.

ADVENTITIOUS GROWTHS IN THE HEART.

Fibrous, cartilaginous, and bony formations have been observed in some rare instances in the muscular tissue. Isolated calcareous masses have sometimes been embedded in the cardiac walls. Fibrinous coagula and polypous concretions may be found in the cavities of the heart. The former consist of coagulated fibrin, separated from the mass of blood, of a whitish or yellowish white color, translucent, of a jellylike consistence, and having a nucleus in the center. They may slightly adhere to the surface of the cavity, from which they can easily be separated without altering the structure of the endocardium. They probably result from an excess of coagulability of fibrin, which is produced by an organization of the lymph during exudation. They are usually found in the right auricle and ventricle.

Symptoms.—These are frequently uncertain; they may, however, be suspected when the action of the heart suddenly becomes embarrassed with irregular and confused pulsations, great difficulty of breathing, and the usual signs dependent upon the imperfect arterialization of the blood. Stimulants, whisky, or carbonate of ammonia may be of service.

PALPITATION OF THE HEART.

This is a tumultuous and usually irregular beating of the heart. It may be due to a variety of causes, both functional and organic. It may occur as a result of indigestion, fright, increased nervousness, sudden excitement, excessive speeding, etc.

Symptoms.—The heart may act with such violence that each beat may jar the whole body of the animal; very commonly it may be heard at a short distance away from the animal. It can usually be traced very readily to the exciting cause, which we may be able to avoid or overcome in the future and thereby obviate subsequent attacks. Rest, a mild stimulant, or a dose or two of tincture of digitalis or opium will generally give prompt relief. When it is due to organic impairment of the heart it must be regarded as a symptom, not as a matter of primary specific treatment.

SYNCOPE, OR FAINTING.

Actual fainting rarely occurs among horses. It may, however, be induced by a rapid and great loss of blood, pain of great intensity, a mechanical interference with the circulation of the brain, etc.

Symptoms.—Syncope is characterized by a decrease or temporary suspension of the action of the heart and respiration, with partial or total loss of consciousness. It generally occurs suddenly, though there may be premonitory symptoms, as giddiness, or vertigo, dilated pupil, staggering, a rapidly sinking pulse, and dropping to the ground. The pulse is feeble or ceases to beat; the surface of the body turns cold; breathing is scarcely to be perceived, and the animal may be entirely unconscious. This state is uncertain in duration—generally it lasts only a few minutes; the circulation becomes restored, breathing becomes more distinct, and consciousness and muscular strength return. In cases attended with much hemorrhage or organic disease of the heart, the fainting fit may be fatal; otherwise it will prove but a transient occurrence. In paralysis of the heart the symptoms may be exactly similar to syncope. Syncope may be distinguished from apoplexy by the absence of stertorous breathing and lividity of the visible mucous membranes.

Treatment.—Dash cold water on the head; administer a stimulant—4 ounces of whiskey or half an ounce of carbonate of ammonia. Prevent the animal from getting up too soon, or the attack may immediately recur. Afterwards if the attack was due to weakness from loss of blood, impoverished blood, or associated with debility, general tonics, rest, and nourishing food are indicated.

HYPERTROPHY OF THE HEART, OR CARDIAC ENLARGEMENT.

Hypertrophy of the heart implies augmentation of bulk in its muscular substance, with or without dilatation or contraction of its cavities. It may exist with or without other cardiac affections. In valvular disease or valvular insufficiency hypertrophy frequently results as a consequence of increased demand for propelling power. The difficulties with which it is most frequently connected are dilatation and ossification of the valves. It may also occur in connection with atrophied kidneys, weak heart, etc. It may be caused by an increased determination of blood to the organ or from a latent form of myocarditis, and it may arise from a long-continued increase of action dependent upon nervous disease.

Symptoms.—In the hypertrophy of the heart, in addition to the usual symptoms manifested in organic diseases of the heart, there is a powerful and heaving impulse at each beat, which may be felt on the left side, often also on the right. These pulsations are regular, and when full and strong at the jaw there is a tendency to active congestion of the capillary vessels, which frequently gives rise to local inflammation, active hemorrhage, etc. If the pulse is small and feeble at the jaw, we may conclude that there is some obstacle to the escape of the blood from the left ventricle into the aorta, which has given rise to the hypertrophy. In case of hypertrophy with dilatation, the impulse is not only powerful and heaving, but it is diffused over the whole region of the heart, and the normal sounds of the heart are greatly increased in intensity. Percussion reveals an enlarged area of dullness, while the impulse is usually much stronger than normal.

Dropsy of the pericardium will give the same wide space of dullness, but the impulse and sound are lessened. An animal with a moderate degree of enlargement may possibly live a number of years and be capable of ordinary work; it depends largely upon concomitant disease. As a rule, an animal affected with hypertrophy of the heart will soon be incapacitated for work, and it becomes useless and incurable.

Treatment.—If the cause can be discovered and is removable, it should be done. The iodide of potassa, in cases of valvular thickening, may be of some benefit if continued for a sufficient length of time; it may be given in 2-dram doses, twice a day, for a month or more. The tincture of digitalis may be given, in cases where the pulse is weak, in doses of 2 teaspoonfuls three times daily. This remedy should not be continued if the pulse becomes irregular. General tonics, freedom from excitement or fatigue, avoidance of bulky food, good ventilation, etc., are indicated.

DILATATION OF THE HEART.

This is an enlargement, or stretching, of the cavities of the heart, and may be confined to one or extend to all. Two forms of dilatation may be mentioned—simple dilatation, where there is normal thickness of the walls, and passive, or attenuated, dilatation, where the walls are simply distended or stretched out without any addition of substance.

Causes.—Any cause producing constant and excessive exertion of the heart may lead to dilatation. Valvular disease is the most frequent cause. General anemia predisposes to it by producing relaxation of muscular fiber. Changes in the muscular tissue of the heart walls, fatty degeneration and infiltration, and atrophy of the muscular fibers may all lead to dilatation.

Symptoms.—The movements of the heart are feeble and prolonged, a disposition to staggering or vertigo, dropsy of the limbs, very pale or very dark-colored membranes, and difficult breathing on the slightest excitement. General tonics, rich food, and rest are the treatment.

FATTY DEGENERATION OF THE HEART.

Fatty degeneration may involve the whole organ, or may be limited to its walls, or even to circumscribed patches. The latter is situated at the exterior, and gives it a mottled appearance. When generally involved it is flabby, and in extreme cases collapses when emptied or cut. Upon dissection the interior of the ventricles is observed to be covered with buff-colored spots of a singular zigzag form. This appearance may be noticed beneath the pericardium, and pervading the whole thickness of the ventricular walls, and in extreme cases those of the fleshy columns in the interior of the heart. These spots are found to be degenerated muscular fibers and colonies of oil globules. Fatty degeneration is often associated with other morbid conditions of the heart, such as obesity, dilatation, rupture, aneurism, etc. It may be connected with fatty diseases of other organs, such as the liver, kidneys, etc. When it exists alone its presence is seldom suspected previous to death. It may be secondary to hypertrophy of the heart, to myocarditis, or to pericarditis. It may be due to deteriorated conditions of the blood in wasting diseases, excessive hemorrhages, etc., or to poisoning with arsenic and phosphorus.

Symptoms.—The most prominent symptoms of fatty degeneration are a feeble action of the heart, a remarkably slow pulse, general debility, and attacks of vertigo. It may exist for a long time, but is apt to terminate suddenly in death upon the occurrence of other diseases, surgical operations, etc. It may involve a liability to sudden death from rupture of the ventricular walls.

Treatment.—Confinement in feed to oats, wheat or rye bran, and timothy hay. Twenty drops of sulphuric acid may be given in drinking water three times a day, and hypophosphite of iron in 2-dram doses, mixed with the feed, twice a day. Other tonics and stimulants as they may be indicated.

RUPTURE OF THE HEART.

This may occur as the result of some previous disease, such as fatty degeneration, dilatation with weakness of the muscular walls, etc. It may be caused by external violence, a crushing fall, pressure of some great weight, etc. Usually death follows a rupture very quickly, though an animal may live for some time when the rent is not very large.

WEAKNESS OF THE HEART.

This may arise from general debility, the result of exhausting disease, overwork, or heart strain, or loss of blood. It is indicated by a small, feeble, but generally regular pulse, coldness of the body, etc. Treatment should be directed to support and increase the strength of the animal by tonics, rest, and nutritious food. Carbonate of ammonia may be given to stimulate the heart's action and to prevent the formation of heart clot.

CONGESTION OF THE HEART.

Congestion, or an accumulation of the blood in the cavities of the heart may occur, in consequence of fibrinous deposits interfering with the free movements of the valves, usually the product of endocarditis or as a result of excessive muscular exertion. The symptoms are great difficulty of breathing, paleness of the visible mucous membranes, great anxiety, frequently accompanied by a general tremor and cold perspiration, followed by death. It usually results in death very quickly.

CYANOSIS OF NEWBORN FOALS.

This is a condition sometimes found in foals immediately after birth, and is due to nonclosure of the foramen ovale, which allows a mixture of the venous with the arterial blood in the left cavities of the heart. It is characterized by a dark purple or bluish color of the visible mucous membranes, shortness of breath, and general feebleness. Foals thus affected generally live only a few hours after birth.

DISEASES OF ARTERIES, OR ARTERITIS AND ENDARTERITIS.

Inflammation of arteries is rarely observed in the horse as a primary affection. Direct injuries, such as blows, may produce a contusion and subsequent inflammation of the wall of an artery; severe muscular strain may involve an arterial trunk; hypertrophy of the heart, by increasing arterial tension, may result in the production of a general endarteritis. Septic infection may affect the inner coat and ultimately involve all three, or it may be the result of an inflammation of the vicinity of the vessels, etc. Inflammation of arteries, whatever the cause may be, often leads to very serious results in the development of secondary changes in their walls. Arteritis may be acute, subacute, or chronic; when the inner coat alone is affected it is known as endarteritis. Arteritis is characterized by a painful swelling along the inflamed vessel, throbbing pulse, coldness of the parts supplied by the inflamed vessel, sometimes the formation of gangrenous sloughs, suppuration, abscess, etc. In an inflammation of the iliac arteries we find coldness and excessive lameness or paralysis of one or both hind limbs. The treatment is carbonate of potassa in 1-dram doses, to be given in 4 ounces of liquor acetate of ammonia every six hours; scalded bran sufficient to produce loosening of the bowels, and complete rest; externally, applications of hot water or hot hop infusion.

ATHEROMA.

Atheroma is a direct result of an existing chronic endarteritis, the lining membrane of the vessels being invariably involved to a greater or less degree. It is most frequently found in the arteries, although the veins may develop an atheromatous condition when exposed to any source of prolonged irritation. Atheroma may affect arteries in any part of the body; in some instances almost every vessel is diseased, in others only a few, or even parts of one vessel. It is a very common result of endocarditis extending into the aorta, which we find perhaps the most frequent seat of atheroma. As a result of this condition the affected vessel becomes impaired in its contractile power, loses its natural strength, and, in consequence of its inability to sustain its accustomed internal pressure, undergoes in many cases dilatation at the seat of disease, constituting aneurism. In an atheromatous vessel, calcareous deposits soon occur, which render it rigid, brittle, and subject to ulceration or rupture. In such vessels the contractility is destroyed, the middle coat atrophied and beyond repair. Atheroma in the vessels of the brain is a frequent cause of cerebral apoplexy. No symptoms are manifested by which we can recognize this condition during life.

CONSTRICTION OF AN ARTERY.

This is usually the result of arteritis, and may partly or wholly be impervious to the flow of blood. When this occurs in a large vessel it may be followed by gangrene of the parts; usually, however, collateral circulation will be established to nourish the parts previously supplied by the obliterated vessel. In a few instances constriction of the aorta has produced death.

RUPTURE OF AN ARTERY.

Endarteritis, with its subsequent changes in the walls of arteries, is the primary cause of rupture in the majority of instances. The rupture may be partial, involving only one or two coats, and will then form an aneurism. If complete, it may produce death when it involves a large vessel, especially if it is situated in one of the large cavities permitting an excessive escape of blood. Rupture may be produced by mechanical violence or accident.

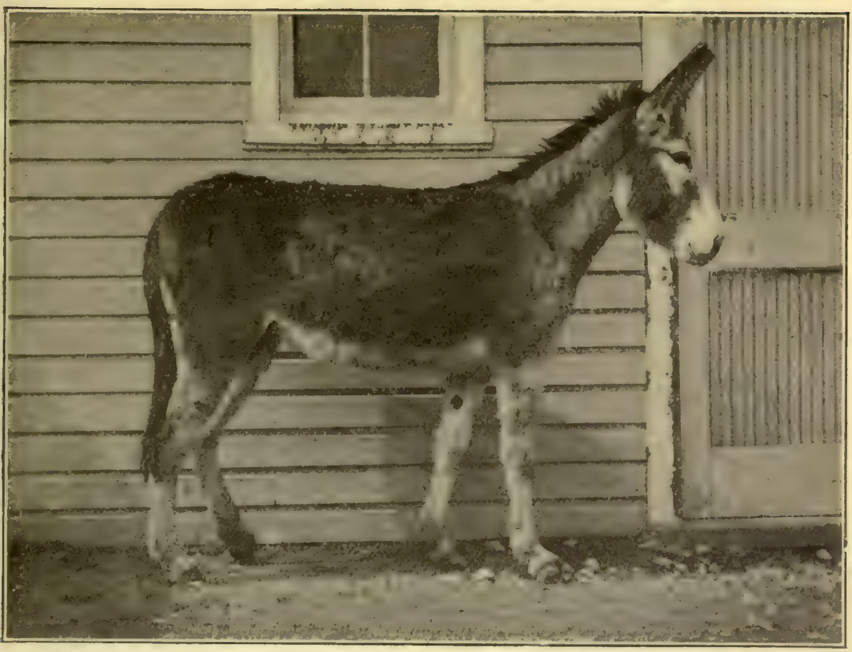
Symptoms.—In fatal rupture associated with profuse bleeding, the animal becomes weak, the visible mucous membranes become blanched, the breathing hurried or gasping, pupils dilated, staggering in gait, syncope, death. When the hemorrhage is limited, the symptoms may not become noticeable; if it is near the surface of the body a round or diffuse swelling or tumor may form. If the rupture is associated with an external wound the bleeding artery should be ligated, or where a bandage is applicable, pressure may be applied by tight bandaging. As a secondary result of rupture of an artery we may have formation of abscess, gangrene of a part, etc.

Treatment.—When rupture of a deep-seated artery is suspected, large doses of fluid extract of ergot may be given to produce contraction of the blood vessels. Tannin and iron are also useful. The animal should be allowed to have as much water as he desires. Afterwards stimulants and nourishing food are indicated.

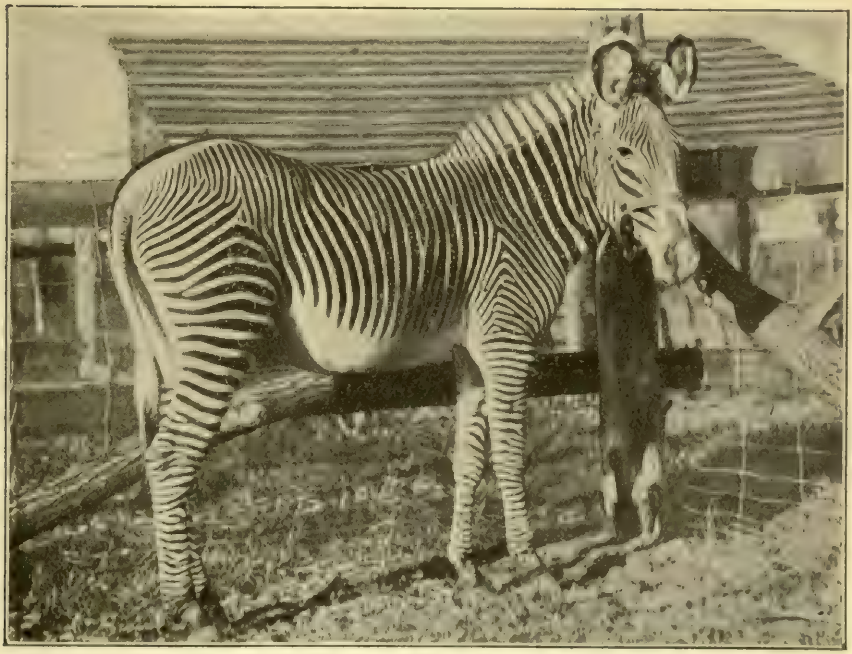
THROMBUS AND EMBOLISM.

By thrombosis is generally understood the partial or complete closure of a vessel by a morbid product developed at the site of the obstruction. The coagulum, which is usually fibrinous, is known as a thrombus. The term embolism designates an obstruction caused by any body detached and transported from the interior of the heart or of some vessel. Thrombi occur as the result of an injury to the wall of the vessel or may follow its compression or dilatation; they may result from some alteration of the wall of the vessel by disease or by the retardation of the circulation. These formations may occur during life, in the heart, arteries, veins, or in the portal system. When a portion of fibrin coagulates in one of the arteries and is carried along by the circulation, it will be arrested, of course, in the capillaries, if not before; when in the veins, it may not be stopped until it reaches the lungs; and when in the portal system, the capillaries of the liver will prevent its further progress.

Symptoms.—When heart clot, or thrombus, exists in the right side, the return of blood from the body and the aeration in the lungs is impeded, and if death occurs, it is owing to syncope rather than to strangulation in pulmonary respiration. There will be hurried and gasping breathing, paleness and coldness of the surface of the body, a feeble and intermittent or fluttering pulse, and fainting. When a fibrinous coagulum is carried into the pulmonary artery from the right side of the heart, the indications are a swelling and infiltration of the lungs and pulmonary apoplexy. When the clot is situated in the left cavities of the heart or in the aorta, death,



Female Donkey, Dam of Oldest Male Hybrid. Height 12½ Hands; Weight 560 Lbs. Dept. of Agr.



Male Zebra "Dan," the Sire of all Hybrids Thus Far Produced. Height 13½ Hands; Weight 800 Lbs. Dept. of Agr.

if it occurs, takes place either suddenly or at the end of a few hours from coma.

Treatment.—The urgent symptoms should be relieved by rest, stimulants, and the use of agents which will act as solvents to the fibrinous clots. Carbonate of ammonia may be administered in all cases of thrombus, and should be continued for a long time in small doses several times a day. In cases of great debility associated with a low grade of fever, stimulants and tonics may be beneficial.

DISEASES OF VEINS, OR PHLEBITIS.

Inflammation of veins may be simple or diffuse. In simple phlebitis the disease of the vein is confined to a circumscribed or limited portion of a vein; in diffuse it involves the vein for a long distance; it may even extend from a limb or foot to the heart. Phlebitis may be induced by contusions or direct injuries, an extension of inflammation from surrounding tissue, such as in abscess, formation of tumor, or malignant growth. It is often due to embolism of infective material, gangrenous matter, etc. Bloodletting from the jugular vein is occasionally followed by dangerous phlebitis.

Symptoms and Pathology.—The symptoms vary according to the extent and severity of the inflammation. In most cases the vein is swollen, thickened, and indurated to such a degree as to resemble an artery. A diffused swelling, with great tenderness, may extend along the affected vessel and the animal manifest all the symptoms connected with acute fever and general functional disturbance. The disease is only serious when large veins are affected. The coats undergo the same changes as in arteritis; clots of blood and lymph plug the inflamed vessel, and, if the inflammatory process continues, these are converted into pus, which ruptures the vessel and produces a deep abscess; or it may be carried away in the circulation and produce abscess in the lungs or other remote organs. In mild cases the clots may become absorbed and the vessel restored to health. Phlebitis in the course of the veins of the limbs frequently leads to numerous abscesses, which may be mistaken for farcy ulcerations.

Treatment.—Phlebitis should be treated by the application of a smart blister along the course of the inflamed vessel; early opening of any abscesses which may form; the animal should have complete rest, and the bowels be kept loose with bran mashes. When the fever runs high, half-ounce doses of nitrate of potassa may be given in the drinking water, which may be changed in two or three days for 1-dram doses of the iodide of potassa. If the animal becomes debilitated, carbonate of ammonia, 1 dram, and powdered gentian, 3 drams, may be given every six hours.

VARICOSE VEINS, VARIX, OR DILATATION OF VEINS.

This may be a result of weakening of the coats from inflammatory disease and degeneration. It may also be due to mechanical obstruction from internal or external sources. It is sometimes found in the vein which lies superficial over the inside of the hock joint, and may be due to the pressure of a spavin. Occasionally it may be observed in stallions, which are more or less subject to dilatation of the veins of the testicular cord. Hemorrhoidal veins, or piles, are occasionally met with, generally in horses which run at pasture. Varicose veins may ulcerate and form an abscess in the surrounding tissues, or they may rupture from internal blood pressure and the blood form large tumors where the tissues are soft.

Treatment.—Stallions which manifest a tendency to varicocele should wear suspensory bags when they are exercised. Piles may often be reduced by astringent washes—tea made from white-oak bark or a saturated solution of alum. The bowels should be kept loose with bran mashes and the animal kept quiet in the stable. When varicose veins exist superficially and threaten to produce inconvenience, they may be ligated above and below and thus obliterated. Sometimes absorption may be induced by constant bandages.

DISEASES OF THE LYMPHATIC SYSTEM.

The lymphatic, or absorbent, system is connected with the blood-vascular system, and consists of a series of tubes which absorb and convey to the blood certain fluids. These tubes lead to lymphatic glands, through which the fluids pass to reach the right lymphatic vein and thoracic duct, both of which enter the venous system near the heart. Through the excessively thin walls of the capillaries the fluid part of the blood transudes to nourish the tissues outside the capillaries; at the same time fluid passes from the tissues into the blood.

LOCAL INFLAMMATION AND ABSCESS OF LYMPHATIC GLANDS.

Acute inflammation of the lymph glands usually occurs in connection with some inflammatory process in the region from which its lymph is gathered. Several or all of the glands in a cluster may become affected, as in strangles, nasal catarrh, or nasal gleet, diseased or ulcerated teeth, the lymph glands between the branches of the lower jaw almost invariably become affected, which may lead to suppuration. Similar results obtain in other portions of the body; in pneumonia the bronchial glands become affected; in pharyngitis, the glands lying above the trachea become affected, etc.

Symptoms.—The glands swell and become painful to the touch, the connective tissue surrounding them becomes involved, suppuration usually takes place, and one or more abscesses form. If the inflammation is of a milder type, resolution may take place and the swelling recede, the exudative material being absorbed, and the gland restored without the occurrence of suppuration. In the limbs a whole chain of the glands along the lymphatic vessels may become affected, as in farcy, phlebitis, or septic poisoning.

Treatment.—Fomentation with hot water and the application of camphorated soap liniment or camphorated oil may produce a revulsive action and prevent suppuration. If there is any indication of abscess forming, poultices of linseed meal and bran made into a paste with hot water should be applied, or a mild blistering ointment rubbed in over the swollen gland. As soon as fluctuation can be felt a free opening must be made for the escape of the contained pus. The wound may subsequently be washed out with a solution of chloride of zinc, 5 grains to the ounce of water, three times a day.

LYMPHANGITIS.

Specific inflammation of the lymphatic structures usually affects the hind legs; very seldom a fore leg. This disease is very sudden in its attack, exceedingly painful, accompanied by a high temperature and great general disturbance. Horses of lymphatic, or sluggish, temperament are predisposed to this affection. It usually attacks well-fed animals, and in such cases may be due to an excess of nutritive elements in the blood. Sudden changes in work or in the habits of the animal may induce an attack.

Symptoms and Treatment.—It is usually ushered in by a chill, rise in temperature, and some uneasiness; in a very short time this is followed by lameness in one leg and swelling on the inside of the thigh. The swelling gradually surrounds the whole limb and continues on downward until it reaches the foot. The limb is excessively tender to the touch, the animal perspires, the breathing is accelerated, pulse hard and quick, and the temperature may reach 106° F. The bowels early become constipated and the urine scanty. The symptoms usually are on the increase for about two days, then they remain stationary for the same length of time; the fever then abates; the swelling recedes and becomes less painful. It is very seldom, though, that all the swelling leaves the leg; generally it leaves some permanent enlargement, and the animal becomes subject to recurrent attacks. The parts should be bathed freely and frequently with water as hot as the hand can bear and then fomented with vinegar and water, equal parts, to which add 2 ounces of nitrate of potassa for each gallon. This should be applied frequently, after the hot water for the first day. Afterwards, the leg may be dried with a woolen cloth and bathed with camphorated soap liniment. Internally, administer artificial Carlsbad salts in 2 to 4 ounce doses three times daily. Feed lightly and give complete rest. This treatment, if instituted early in the attack, very frequently brings about a remarkable change within twenty-four hours.—(Spl. Rpt. Horse, Dept. Ag. 1911.)

DISEASES OF THE NERVOUS SYSTEM.

ANATOMY AND PHYSIOLOGY OF THE BRAIN AND NERVOUS SYSTEM.

The nervous system may be regarded as consisting of two sets of organs, peripheral and central, the function of one being to establish a communication between the centers and the different parts of the body, and that of the other to generate nervous force. The whole may be arranged under two divisions: First, the cerebro-spinal system; second, the sympathetic, or ganglionic system. Each is possessed of its own central and peripheral organs.

In the first, the center is made up of two portions—one large and expanded (the brain) placed in the cranial cavity; the other elongated (spinal cord), continuous with the brain, and lodged in the canal of the vertebral column. The peripheral portion of this system consists of the cerebro-spinal nerves, which leave the axis in symmetrical pairs, and are distributed to the skin, the voluntary muscles, and the organs. In the second, the central organ consists of a chain of ganglia connected by nerve cords which extends from the head to the rump on each side of the spine. The nerves of this system are distributed to the involuntary muscles, mucous membrane, viscera, and blood vessels. The two systems have free intercommunication, ganglia being at the junctions.

Nerves are thrown into a state of excitement when stimulated, and are, therefore, said to possess excitable or irritable properties. The stimuli may be applied to, or may act upon, any part of the nerve. Nerves may be paralyzed by continuous pressure being applied. When the nerves divide into branches, there is never any splitting up of their ultimate fibers, nor yet is there ever any coalescing of them; they retain their individuality from their source to their termination.

Nerves which convey impressions to the centers are termed sensory, or centripetal, and those which transmit stimulus from the centers to organs of motion are termed motor, or centrifugal. The function of the nervous system may, therefore, be defined in the simplest terms, as follows: It is intended to associate the different parts of the body in such a manner that stimulus applied to one organ may excite or depress the activity of another.

The brain is that portion of the cerebro-spinal axis within the cranium, which may be divided into four parts—the medulla oblongata, the cerebellum, the pons Varolii, and the cerebrum—and it is covered by three membranes, called the meninges. The outer of these membranes, the dura mater, is a thick, white, fibrous membrane which lines the cavity of the cranium, forming the internal periosteum of the bones; it is continuous with the spinal cord to the extremity of the canal. The second, the arachnoid, is a delicate serous membrane, and loosely envelops the brain and spinal cord; it forms two layers, leaving between them the arachnoid space which contains the cerebro-spinal fluid, the use of which is to protect the spinal cord and brain from pressure. The third, or inner, the pia mater, is closely adherent to the entire surface of the brain, but is much thinner and more vascular than when it reaches the spinal cord, which it also envelops, and is continued to form the sheaths of the spinal nerves.

The medulla oblongata is the prolongation of the spinal cord, extending to the pons Varolii. This portion of the brain is very large in the horse; it is pyramidal in shape, the narrowest part joining the cord. The pons Varolii is the transverse projection on the base of the brain, between the medulla oblongata and the peduncles of the cerebrum. The cerebellum is lodged in the posterior part of the cranial cavity, immediately above the medulla oblongata; it is globular or elliptical in shape, the transverse diameter being greatest. The body of the cerebellum is composed of gray matter externally and of white matter in the center. The cerebellum has the function of co-ordinating movements; that is, of so associating them as to cause them to accomplish a definite purpose. Injuries to the cerebellum cause disturbances of the equilibrium, but do not interfere with the will power or intelligence.

The cerebrum, or brain proper, occupies the anterior portion of the cranial cavity. It is ovoid in shape, with an irregular flattened base, and consists of lateral halves or hemispheres. The greater part of the cerebrum is composed of white matter. The hemispheres of the cerebrum are usually said to be the seat of all psychical activities. Only when they are intact are the process of feeling, thinking, and willing possible. After they are destroyed, the organism comes to be like a complicated machine, and its activity is only the expression of the internal and external stimuli which act upon it.

The spinal cord, or spinal marrow, is that part of the cerebrospinal system which is contained in the spinal canal of the backbone, and extends from the medulla oblongata to a short distance behind the loins. It is an irregularly cylindrical structure divided into two lateral symmetrical halves by fissures. The spinal cord terminates posteriorly in a pointed extremity, which is continued by a mass of nerve trunks—*cauda equinæ*. A transverse section of the cord reveals that it is composed of white matter externally and of gray matter internally. The spinal cord does not fill up the whole spinal canal. The latter contains, besides, a large venous sinus, fatty matter, the membranes of the cord, and the cerebrospinal fluid.

The spinal nerves, forty-two or forty-three in number, arise each by two roots, a superior, or sensory, and an inferior, or motor. The nerves originating from the brain are twenty-four in number, and arranged in pairs, which are named first, second, third, etc., counting from before backward. They also receive special names, according to their functions, or the parts to which they are distributed, viz:

1. Olfactory.
2. Optic.
3. Oculo-motor.
4. Pathetic.
5. Trifacial.
6. Abducens.
7. Facial.
8. Auditory.
9. Glosso-pharyngeal.
10. Pneumogastric.
11. Spinal-accessory.
12. Hypoglossal.

INFLAMMATION OF THE BRAIN AND ITS MEMBRANES.

Inflammation may attack these membranes singly, or any one of the anatomical divisions of the nerve matter, or it may invade the whole at once. Practical experience, however, teaches us that primary inflammation of the dura mater is of rare occurrence, except in direct mechanical injuries to the head or diseases of the bones of the cranium. Neither is the arachnoid often affected with acute inflammation, except as a secondary result. The pia mater is most commonly the seat of inflammation, acute and subacute, but from its intimate relation with the surface of the brain the latter very soon becomes involved in the morbid changes. Practically, we can not separate inflammation of the pia mater from that of the brain proper. Inflammation may, however, exist in the center of the great nerve masses—the cerebrum, cerebellum, pons Varolii, or medulla at the base of the brain—without involving the surface. When, therefore, inflammation invades the brain and its enveloping membranes it is properly called encephalitis; when the membranes alone are affected, it is called *meningitis;* or the brain substance alone, *cerebritis.* Since all of the conditions merge into each other and can scarcely be recognized separately during the life of the animal, they may here be considered together.

ENCEPHALITIS, MENINGITIS, AND CEREBRITIS (INFLAMMATION OF THE BRAIN AND ITS MEMBRANES).

Causes.—Exposure to extreme heat or cold, sudden and extreme changes of temperature, excessive continued cerebral excitement, over-feeding with nitrogenous foods, direct injuries to the brain, such as concussion, or from fracture of the cranium, overexertion, sometimes as sequelæ to influenza, poisons having a direct influence upon the encephalic mass, extension of inflammation from neighboring structures, food poisoning, tumors, parasites, abscesses, etc.

Symptoms.—The diseases here grouped together are accompanied by a variety of symptoms almost none of which, however, are associated so definitely with a special pathological process as to point unmistakably to a given lesion. Usually the first symptoms indicate mental excitement, and these are followed by symptoms indicating depression. Acute encephalitis may be ushered in by an increased sensibility to noises, with more or less nervous excitability, contraction of the pupils of the eyes, and a quick, hard pulse. In very acute attacks these symptoms, however, are not always noted. This condition will soon be followed by muscular twitchings, convulsive or spasmodic movements, eyes wide open with shortness of sight. The animal becomes afraid to have his head handled. Convulsions and delirium will develop, with inability of muscular control, or stupor and coma may supervene. Where the membranes are greatly implicated, convulsions and delirium with violence may be expected, but where the brain substances are principally affected stupor and coma will be the prominent symptoms. In the former condition the pulse will be quick and hard; in the latter, soft or depressed with often a dilatation of the pupils, and deep, slow, stertorous breathing. The symptoms may follow one another in rapid succession, and the disease approach a fatal termination in less than twelve hours. In subacute attacks the symptoms are better defined, and the animal seldom dies before the third day. Within three or four days gradual improvement may become manifest, or cerebral softening with partial paralysis may occur. In all cases of encephalitis there is a marked rise in temperature from the very onset of the disease, with a tendency to increase until the most alarming symptoms develop, succeeded by a decrease when coma becomes manifest. The violence and character of the symptoms greatly depend upon the extent and location of the structures involved. Thus, in some cases there may be marked paralysis of certain muscles, while in others there may be spasmodic rigidity of muscles, in a certain region. Very rarely the animal becomes extremely violent early in the attack, and by rearing up, striking with the fore feet, or falling over, may do himself great injury. Usually, however, the animal maintains the standing position, propping himself against the manger or wall, until he falls from inability of muscular control or unconsciousness. Occasionally he may go through a series of automatic movements in his delirium, such as trotting or walking, and, if loose in a stall, will move around in a circle persistently. Early and persistent constipation of the bowels is a marked symptom in nearly all acute affections of the brain; retention of the urine, also, is frequently observed.

Following these symptoms there are depressions, loss of power and consciousness, lack of ability or desire to move, and usually fall of temperature. At this stage the horse stands with legs propped, the head hanging or resting on the manger, the eyes partly closed, and does not respond when spoken to or when struck with a whip.

Chronic encephalitis or meningitis may succeed the acute stage, or may be due to blood poison, lead poisoning, etc. This form may not be characterized in its initial stages by excitability, quick and hard pulse, and high fever. The animal usually appears at first stupid; eats slowly; the pupil of the eye does not respond to light quickly; the animal often throws up his head or shakes it as if suffering sudden twinges of pain. He is slow and sluggish in his movements, or there may be partial paralysis of one limb, one side of the face, neck, or body. These symptoms, with some variations, may be present for several days and then subside, or the disease may pass into the acute stage and terminate fatally. Chronic encephalitis may affect an animal for ten days or two weeks without much variation in the symptoms before the crisis is reached. If improvement commences, the symptoms usually disappear in the reverse order in which they developed, with the exception of the paralytic effects, which remain intractable or permanent. Paralysis of certain sets of muscles is a very common result of chronic, subacute, and acute encephalitis, and is due to softening of the brain or to exudation into the cavities of the brain.

Softening and abscess of the brain is one of the terminations of cerebritis. It may also be due to an insufficient supply of blood as a result of diseased cerebral arteries and of apoplexy. The symptoms are drowsiness, vertigo, or attacks of giddiness, increased timidity, or fear of familiar objects, paralysis of one limb, hemiplegia, imperfect control of the limbs, and usually a weak, intermittent pulse. In some cases the symptoms are analogous to those of apoplexy. The character of the symptoms depends upon the seat of the softening or abscess within the brain.

Cerebral sclerosis sometimes follows inflammation in the structure of the brain affecting the connective tissues, which eventually become hypertrophied and press upon nerve cells and fibers, causing their ultimate disappearance, leaving the parts hard. This condition gives rise to a progressive paralysis and may extend along a certain bundle of fibers into the spinal cord. Complete paralysis almost invariably supervenes and causes death.

Treatment.—In all acute attacks of inflammation involving the membranes or cerebral masses, it is the pressure from the distended and engorged blood vessels and the rapid accumulation of inflammatory products that endangers the life of the animal in even the very early stage of the disease. The earlier the treatment is commenced to lessen the danger of fatal pressure from the engorged blood vessels, the less amount of inflammatory products and effusion we have to contend with later on. The leading object, then, to be accomplished in the treatment of the first stages of encephalitis, meningitis, or cerebritis is to relieve the engorgement of the blood vessels before a dangerous degree of effusion or exudation has taken place, and thereby lessen the irritation or excitability of the affected structures. If the attempt to relieve the engorgement in the first stage has been only partially successful, and the second stage with its inflammatory products and exudations, whether serous or plastic, has set in, then the main objects in further treatment are to keep up the strength of the animal and hasten the absorption of the exudative products as much as possible. To obtain these results, when the animal is found in the initial stage of the disease, where there is unnatural excitability or stupor with increase of temperature and quickened pulse, we should apply cold to the head in the form of cold water or ice. For this purpose cloths or bags may be used, and they should be renewed as often as necessary. If the disease is still in its early stages and the animal is strong, bleeding from the jugular vein may be beneficial. Good results are to be expected only during the stage of excitement, while there is a strong, full pulse and the mucous membranes of the head are red from a plentiful supply of blood. The finger should be kept on the pulse and the blood allowed to flow until there is distinct softening of the pulse. As soon as the animal recovers somewhat from the shock of the bleeding, the following medicine should be made into a ball or dissolved in a pint of warm water and be given at one dose: Barbados aloes, 7 drams; calomel, 2 drams; powdered ginger, 1 dram; tincture of aconite, 20 drops.

The animal should be placed in a cool, dark place, as free from noise as possible. When the animal becomes thirsty half an ounce of bromide of potash may be dissolved in his drinking water every six hours. Injections of warm water into the rectum may facilitate the action of the purgative. If this treatment fails to give relief, the disease will pass into the advanced stages, or, if the animal has been neglected in the early stages, the treatment must be supplanted, with the hypodermic injection of ergotin, in 5-grain doses, dissolved in 1 dram of water, every six hours. The limbs may be poulticed above the fetlocks with mustard. Warm blanketing, to promote perspiration, is to be observed in all cases in which there is no excessive perspiration.

If the disease becomes chronic we must place our reliance upon alteratives and tonics, with such incidental treatment as special symptoms may demand. Iodide of potassium in 2-dram doses should be given three times a day and 1 dram of calomel once a day to induce absorption of effusions or thickened membranes. Tonics, in the form of iodide of iron in 1-dram doses, to which is added 2 drams of powdered hydrastis, may also be given every six or eight hours, as soon as the active fever has abated. After the disappearance of the acute symptoms, blisters may be applied behind the poll. When paralytic effects remain after the disappearance of all other symptoms, sulphate of strychnia in 2-grain doses, in combination with the other tonics, may be given twice a day, and be continued until it produces muscular twitching. In some cases of paralysis, as of the lips or throat, benefit may be derived from the moderate use of the electric battery. Many of the recoveries will, however, under the most active and early treatment, be but partial, and in all cases the animals become predisposed to subsequent attacks. A long period of time should be allowed to pass before the animal is exposed to severe work or great heat. When the disease depends upon mechanical injuries, they have to be treated and all causes of irritation to the brain removed. If it is due to uremic poisoning, influenza, rheumatism, toxic agents, etc., they should receive prompt attention for their removal. Cerebral softening, abscess, and sclerosis are practically inaccessible to treatment, otherwise than such relief as may be afforded by the administration of opiates and general tonics, and, in fact, the diagnosis is largely presumptive.

CONGESTION OF THE BRAIN, OR MEGRIMS.

Congestion of the brain consists in an accumulation of blood in the vessels, also called hyperemia, or engorgement. It may be active or passive—active when there is an undue determination of blood or diminished arterial resistance, and passive when it accumulates in the vessels of the brain, owing to some obstacle to its return by the veins.

Causes.—Active cerebral congestion may be due to hypertrophy of the left ventricle of the heart, excessive exertion, the influence of extreme heat, sudden and great excitement, artificial stimulants, etc. Passive congestion may be produced by any mechanical obstruction which prevents the proper return of blood through the veins to the heart, such as a small or ill-fitting collar, which often impedes the blood current, tumors or abscesses pressing on the vein in its course, and organic lesions of the heart with regurgitation.

Extremely fat animals with short thick necks are peculiarly subject to attacks of cerebral congestion. Simple congestion, however is merely a functional affection, and in a slight or moderate degree involves no immediate danger. Extreme engorgement, on the contrary, may be followed by rupture of previously weakened arteries and capillaries and cause immediate death, designated then as a stroke of apoplexy.

Symptoms.—Congestion of the brain is usually sudden in its manifestation and of short duration. The animal may stop very suddenly and shake his head or stand quietly braced on his legs, then stagger, make a plunge, and fall. The eyes are staring, breathing hurried and the nostrils widely dilated. This may be followed by coma, violent convulsive movements, and death. Generally, however, the animal gains relief in a short time, but he may remain weak and giddy for several days. If this is due to organic change of the heart or to disease of the blood vessels in the brain, then the symptoms may be of slow development manifested by drowsiness, dimness or imperfect vision, difficulty in voluntary movements, diminished sensibility of the skin, loss of consciousness, delirium, and death. In milder cases effusion may take place in the arachnoid spaces and ventricles of the brain, followed by paralysis and other complications.

Pathology.—In congestion of the brain the cerebral vessels are loaded with blood, and the venous sinuses distended to an extreme degree, and the pressure exerted upon the brain constitutes actual compression, giving rise to the symptoms just mentioned. On postmortem examinations this engorgement is found universal throughout the brain and its membranes, which serves to distinguish it from inflammations of these structures, in which the engorgements are confined more or less to circumscribed portions. A prolonged congestion may, however, lead to active inflammation, and in that case we will find serous and plastic exudations in the cavities of the brain. In addition to the intensely engorged condition of the vessels we find the gray matter of the brain redder in color than natural. In cases where several attacks have occurred the blood vessels are often found permanently dilated.

Treatment.—Prompt removal of all mechanical obstructions to the circulation. If it is due to venous obstruction by too tight a collar, the loosening of the collar will give immediate relief. The horse should be bled freely from the jugular vein. If due to tumors or abscesses, a surgical operation becomes necessary to afford relief. To revive the animal if he becomes partially or totally unconscious, cold water should be dashed on the head. Give a purge of Glauber's salts. If the limbs are cold, tincture of capsicum or strong mustard water should be applied to them. If symptoms of paralysis remain after two or three days, an active cathartic and iodide of potassa will be indicated, to be given as prescribed for inflammation of the brain.

Prevention.—Well-adjusted collar, with strap running from the collar to the girth, to hold down the collar when pulling upgrade; regular feed and exercise, without allowing the animal to become excessively plethoric; moderate checking, allowing a free-and-easy movement of the head; well-ventilated stabling, proper cleanliness, pure water, etc.

SUNSTROKE, HEAT STROKE, OR HEAT EXHAUSTION.

The term sunstroke is applied to affections occasioned not exclusively by exposure to the sun's rays, as the word signifies, but by the action of great heat combined generally with humid atmosphere. Exhaustion produced by a long-continued heat is often the essential factor, and is called heat exhaustion. Horses on the race track undergoing protracted and severe work in hot weather often succumb to heat exhaustion. Draft horses exposed to the direct rays of the sun for many hours, which do not receive proper care in watering, feeding, and rest in shady places, suffer very frequently from sunstroke.

Symptoms.—Sunstroke is manifested suddenly. The animal stops, drops his head, begins to stagger, and soon falls to the ground unconscious. The breathing is marked with great stertor, the pulse is very slow and irregular, cold sweats break out in patches on the surface of the body, and the animal often dies without recovering consciousness. The temperature becomes very high, reaching 105° to 109° F.

In heat exhaustion the animal usually requires urging for some time previous to the appearance of any other symptoms, generally perspiration is checked, and then he becomes weak in his gait, the breathing hurried or panting, eyes watery or bloodshot, nostrils dilated and highly reddened, assuming a dark, purple color; the pulse is rapid and weak, the heart bounding, followed by unconsciousness and death. If recovery takes place, convalescence extends over a long period of time, during which inco-ordination of movement may persist.

Pathology.—Sunstroke, virtually active congestion of the brain, often accompanied by effusion and blood extravasation, characterizes this condition, with often rapid and fatal lowering of all the vital functions. The death may be due in many instances to the complete stagnation in the circulation of the brain, inducing anemia, or want of nourishment of that organ. In other cases it may be directly due to the excessive compression of the nerve matter controlling the heart's action, and cause paralysis of that organ. There are also changes in the composition of the blood.

Treatment.—Under no circumstances is bloodletting permissible in sunstroke. Ice or very cold water should be applied to the head and along the spine, and half an ounce of carbonate of ammonia or 6 ounces of whiskey should be given in 1 pint of water. Cold water should be showered upon the body of the horse from the hose or otherwise. This should be continued until the temperature is down to 103° F. Brisk friction of the limbs and the application of spirits of camphor often yield good results. The administration of the stimulants should be repeated in one hour if the pulse has not become stronger and slower. In either case, when reaction has occurred, preparations of iron and general tonics may be given during convalescence: Sulphate of iron, 1 dram; gentian, 3 drams; red cinchona bark, 2 drams; mix and give in the feed morning and evening.

Prevention.—In very hot weather horses should have wet sponges or light sunshades on the head when at work, or the head may be sponged with cold water as many times a day as possible. Proper attention should be given to feeding and watering, never in excess. During the warm months all stables should be cool and well ventilated, and if an animal is debilitated from exhaustive work or disease he should receive such treatment as will tend to build up the system. Horses should be permitted to drink as much water as they want while they are at work during hot weather. An animal which has been affected with sunstroke is very liable to have subsequent attacks when exposed to the necessary exciting causes.

APOPLEXY, OR CEREBRAL HEMORRHAGE.

Apoplexy is often confounded with cerebral congestion, but true apoplexy always consists in rupture of cerebral blood vessels, with blood extravasation and formation of blood clot. Two causes are involved in the production of apoplexy, the predisposing and the exciting. The predisposing cause is degeneration, or disease which weakens the blood vessel; the exciting cause is any one which tends to induce cerebral congestion.

Symptoms.—Apoplexy is characterized by a sudden loss of sensation and motion, profound coma, and stertorous and difficult breathing. The action of the heart is little disturbed at first, but soon becomes slower, then quicker and feebler, and after a little time ceases. If the rupture is one of a small artery and the extravasation limited, sudden paralysis of some part of the body is the result. The extent and location of the paralysis depend upon the location within the brain which is functionally deranged by the pressure of the extravasated blood; hence these conditions are very variable. In the absence of any premonitory symptoms or an increase of temperature in the early stage of the attack, we may be reasonably certain in making the distinction between this disease and congestion of the brain, or sunstroke.

Pathology.—In apoplexy there is generally found an atheromatous condition of the cerebral vessels, with weakening and degeneration of their walls. When a large artery has been ruptured it is usually followed by immediate death, and large rents may be found in the cerebrum, with great destruction of brain tissue, induced by the forcible pressure of the liberated blood. In small extravasations producing local paralysis without marked general disturbance, the animal may recover after a time; in such cases gradual absorption of the clot takes place. In large clots atrophy of the brain substances may follow, or softening and abscess from want of nutrition may result, and render the animal worthless, ultimately resulting in death.

Treatment.—Place the animal in a quiet, cool place and avoid all stimulating food. Administer, in his drinking water or feed, 2 drams of the iodide of potassa twice a day for several weeks if necessary. Medical interference with sedatives or stimulants is more apt to be harmful than of benefit, and bloodletting in an apoplectic fit is extremely hazardous. From the fact that cerebral apoplexy is due to diseased or weakened blood vessels, the animal remains subject to subsequent attacks.

COMPRESSION OF THE BRAIN.

Causes.—In injuries from direct violence a piece of broken bone may press upon the brain, and, according to its size, the brain is robbed of its normal space within the cranium. It may also be due to an extravasation of blood or to exudation in the subdural or arachnoid spaces. Death from active cerebral congestion results through compression. The occurrence may sometimes be traced to the direct cause, which will give assurance for the correct diagnosis.

Symptoms.—Impairment of all the special senses and localized paralysis. All the symptoms of lessened functional activity of the brain are manifested to some degree. The paralysis remains to be our guide for the location of the cause, for it will be found that the paralysis occurs on the opposite side of the body from the location of the injury, and the parts suffering paralysis will denote, to an expert veterinarian or physician, the part of the brain which is suffering compression.

Treatment.—Trephining, by a skillful operator, for the removal of the cause when due to depressed bone or the presence of foreign bodies. When the symptoms of compression follow other acute diseases of the brain, apoplectic fits, etc., the treatment must be such as the exigencies of the case demands.

CONCUSSION OF THE BRAIN.

Causes.—This is generally caused by an animal falling over backward and striking his poll, or perhaps falling forward on his nose; by a blow on the head, etc. Train accidents during shipping often cause concussion of the brain.

Symptoms.—Concussion of the brain is characterized by giddiness, stupor, insensibility, or loss of muscular power, succeeding immediately upon a blow or severe injury involving the cranium. The animal may rally quickly or not for hours; death may occur on the spot or after a few days. When there is only slight concussion or stunning, the animal soon recovers from the shock. When more severe, insensibility may be complete and continue for a considerable time; the animal lies as if in a deep sleep; the pupils are insensible to light; the pulse fluttering or feeble; the surface of the body cold, muscles relaxed, and the breathing scarcely perceptible. After a variable interval partial recovery may take place, which is marked by paralysis of some parts of the body, often a limb, the lips, ear, etc. Convalescence is usually tedious, and frequently permanent impairment of some organs remains.

Pathology.—Concussion produces laceration of the brain, or at least a jarring of the nervous elements, which, if not sufficiently severe to produce sudden death, may lead to softening or inflammation, with their respective symptoms of functional derangement.

Treatment.—The first object in treatment will be to establish reaction or to arouse the feeble and weakening heart. This can often be accomplished by dashing cold water on the head and body of the animal; frequent injections of weak ammonia water, ginger tea, or oil and turpentine should be given per rectum. In the majority of cases this will soon bring the horse to a state of consciousness. In more severe cases mustard poultices should be applied along the spine and above the fetlocks. As soon as the animal gains partial consciousness stimulants, in the form of whisky or capsicum tea, should be given. Owing to severity of the structural injury to the brain or the possible rupture of blood vessels and blood extravasation, the reaction may often be followed by encephalitis or cerebritis, and will then have to be treated accordingly. For this reason the stimulants should not be administered too freely, and they must be abandoned as soon as reaction is established. There is no need for further treatment unless complications develop as a secondary result. Bleeding, which is so often practiced, proves almost invariably fatal in this form of brain affection. We should also remember that it is never safe to drench a horse with large quantities of medicine when he is unconscious, for he is very liable to draw the medicine into the lungs in inspiration.

Prevention.—Young horses, when harnessed or bitted for the first few times, should not have their heads checked up high, for it frequently causes them to rear up, and, being unable to control their balance, they are liable to fall over sideways or backwards, thus causing brain concussion when they strike the ground.

ANEMIA OF THE BRAIN.

This is a physiological condition in sleep. It is considered a disease or may give rise to disease when the circulation and blood supply of the brain are interfered with. In some diseases of the heart the brain becomes anemic, and fainting fits occur, with temporary loss of consciousness. Tumors growing within the cranium may press upon one or more arteries and stop the supply of blood to certain parts of the brain, thus inducing anemia, ultimately atrophy, softening, or suppuration. Probably the most frequent cause is found in plugging of the arteries by a blood clot.

The symptoms are imperfect vision, constantly dilated pupils, frequently a feeble and staggering gait, and occasionally cramps, convulsions, or epileptic fits occur. The pathology is the exact opposite of cerebral hyperemia. The blood vessels are found empty, the membranes blanched, and the brain substance softened. Removal of the remote cause when possible is the treatment. General tonics, nutritious food, rest, and removal from all causes of nervous excitement.

HYDROCEPHALUS, OR DROPSY OF THE BRAIN.

This condition consists in an unnatural collection of fluid about or in the brain. Depending upon the location of the fluid, we speak of external and internal hydrocephalus. External hydrocephalus is seen chiefly in young animals. It consists in a collection of fluid under the meninges, but outside of the brain proper. This defect is usually congenital. It is accompanied by an enlargement of the skull, especially in the region of the forehead. The pressure of the fluid may cause the bones to soften. The disease is incurable and usually fatal. Internal hydrocephalus is a disease of mature horses, and consists in the accumulation of an excessive quantity of fluid in the cavities or ventricles of the cerebrum. The cause of this accumulation may be a previous inflammation, a defect in the circulation of blood through the brain, heat stroke, overwork, excessive nutrition, or long-continued indigestion. Common, heavy-headed draft horses are predisposed to this condition.

The symptoms are an expression of dullness and stupidity, and from their nature this disease is sometimes known as dumminess or immobility. A horse so afflicted is called a dummy. Among the symptoms are loss of intelligence, stupid expression, poor memory, etc. The appetite is irregular; the horse may stop chewing with a wisp of hay protruding from his lips; he seems to forget that it is there. Unnatural positions are sometimes assumed, the legs being placed in clumsy and unusual attitudes. Such horses are difficult to drive, as they do not respond readily to the word, to pressure of the bit, or to the whip. Gradually the pulse becomes weaker, respiration becomes faster, and the subject loses weight. Occasionally there are periods of great excitement due to temporary congestion of the brain. At such times the horse becomes quite uncontrollable. A horse so afflicted is said to have the staggers. The outlook for recovery is not good.

Treatment is merely palliative. Regular work or exercise and nutritious food easy of digestion, with plenty of fresh water, are strongly indicated. Intensive feeding should not be practiced. The bowels should be kept open by the use of appropriate diet or by the use of small regular doses of Glauber's salts.

TUMORS WITHIN THE CRANIUM.

Tumors within the cranial cavity and the brain occur not infrequently, and give rise to a variety of symptoms, imperfect control of voluntary movement, local paralysis, epilepsy, etc. Among the more common tumors are the following: Osseous tumors, growing from the walls of the cranium, are not very uncommon. Dentigerous cysts, containing a formation identical to that of a tooth, growing from the temporal bone, sometimes are found lying loose within the cranium. Tumors of the choroid plexus, known as brain sand, are frequently met with on post-mortem examinations, but seldom give rise to any appreciable symptoms during life. They are found in horses at all ages, and are of slow development. They are found in one or both of the lateral ventricles, enveloped in the folds of the choroid plexus. Melanotic tumors have been found in the brain and meninges in the form of small, black nodules in gray horses, and in one instance are believed to have induced the condition known as stringhalt. Fibrous tumors may develop within or from the meningeal structures of the brain. Gliomatous tumor is a variety of sarcoma very rarely found in the structure of the cerebellum. Treatment for tumors of the brain is impossible.

SPASMS, OR CRAMPS.

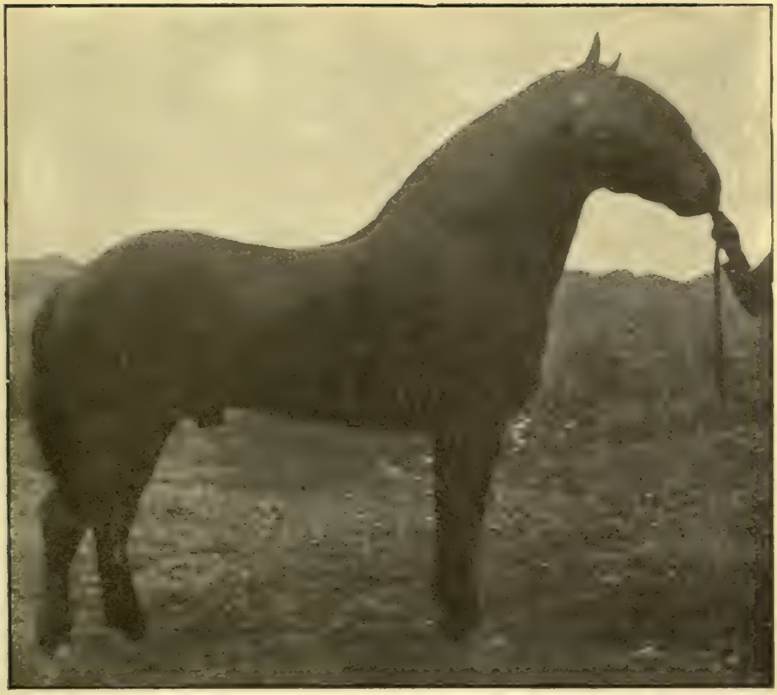
Causes.—Spasm is a marked symptom in many diseases of the brain and of the spinal cord. Spasms may result from irritation of the motor nerves as conductors, or may result from irritation of any part of the sympathetic nervous system, and they usually indicate an excessive action of the reflex motor centers. Spasms may be induced by various medicinal agents given in poisonous doses, or by effete materials in the circulation, such as nux vomica or its alkaloid strychnia, lead preparations, or an excess of the urea products in the circulation, etc. Spasms may be divided into two classes: Tonic spasm, when the cramp is continuous or results in persistent rigidity, as in tetanus; clonic spasm, when the cramping is of short duration, or is alternated with relaxations. Spasms may affect involuntary as well as the voluntary muscles, the muscles of the intestines, and even the heart. They are always sudden in their development.

Spasm of the Glottis.—This is manifested by a strangling respiration; a wheezing noise is produced in the act of inspiration; extreme anxiety and suffering for want of air. The head is extended, the body profusely perspiring; pulse very rapid; soon great exhaustion becomes manifest; the mucous membranes become turgid and very dark colored, and the animal thus may suffocate in a short time.

Spasms of the Neck of the Bladder.—This may be due to spinal irritation or a reflex from intestinal irritation, and is manifested by frequent but ineffectual attempts to urinate.

Spasm of the Diaphragm, or Thumps.—Spasmodic contraction of the diaphragm, the principal muscle used in respiration, is generally occasioned by extreme and prolonged speeding on the race track or road. The severe strain thus put upon this muscle finally induces irritation of the nerves controlling it, and the contractions become very forcible and violent, giving the jerking character known among horsemen as "thumps." This condition may be distinguished from violent beating of the heart by feeling the pulse beat at the angle of the jaw, and at the same time watching the jerking movement of the body, when it will be discovered that the two bear no relation to each other.

Spasm of the Thigh, or Cramp of a Hind Limb.—This is frequently witnessed in horses that stand on sloping plank floors—generally in cold weather—or it may come on soon after severe exercise. It is probably due to an irritation of the nerves of the thigh. In cramps of the hind leg the limb becomes perfectly rigid, and attempts to flex the leg are unsuccessful; the animal stands on the affected limb, but is unable to move it; it is unnaturally cold; it does not, however, appear to cause much suffering unless attempts are made to change position. This cramp may be of short duration—a few minutes—or it may persist for several days. This condition is often taken for a dislocation of the stifle joint. In the latter the foot is extended backward, and the horse is unable to advance it, but drags the limb after him. An examination of the joint also reveals a change in form. Spasms may affect the eyelids, by closure or by retraction. Spasm of the sterno-maxillaris muscle has been witnessed, and the animal was unable to close the jaws until the muscle became relaxed.



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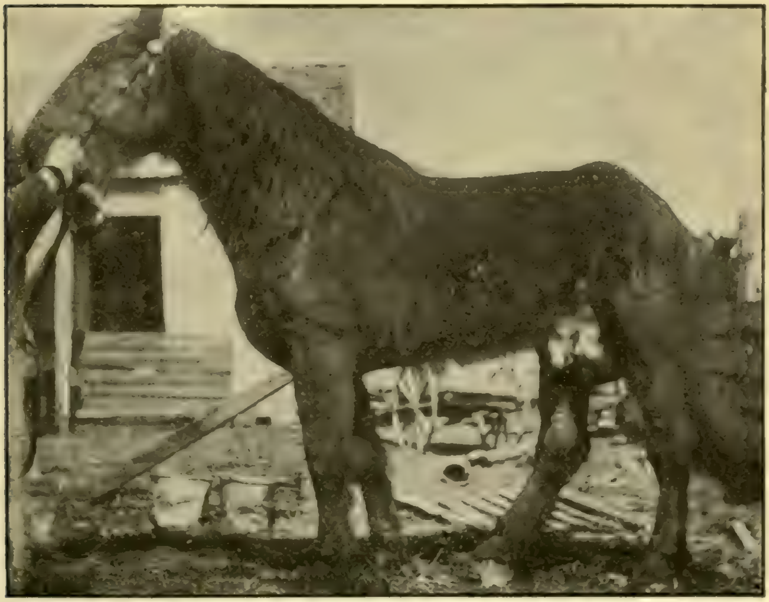

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Treatment of Spasms.—An anodyne liniment, composed of chloroform 1 part and soap liniment 4 parts, applied to cramped muscles will usually cause relaxation. This may be used where single external muscles are affected. In spasms of the glottis, inhalation of sulphuric ether will give quick relief. In spasm of the diaphragm, rest and the administration of half an ounce of chloroform in 3 ounces of whisky, with a pint of water added, will generally suffice to bring relief, or if this fails give 5 grains of sulphate of morphia by hypodermic injection. If spasms result from organic disease of the nervous system, the latter should receive such treatment as its character demands. In cramp of the leg compulsory movement usually causes relaxation very quickly; therefore the animal should be led out of the stable and be forced to run or trot. Sudden nervous excitement caused by a crack of the whip or smart blow, will often bring about immediate relief. Should this fail, the anodyne liniment may be used along the inside of the thigh, and chloroform, ether, or laudanum given internally. An ounce of the chloral hydrate will certainly relieve the spasm when given internally, but the cramp may return soon after the effect has passed off, which in many cases it does very quickly.

Convulsions.—Although there is no disease of the nervous system which can be properly termed convulsive, or justify the use of the word convulsion to indicate any particular disease, yet it is often such a prominent symptom that a few words may not be out of place. General, irregular muscular contractions of various parts of the body, with unconsciousness, characterize what we regard as convulsions, and like ordinary spasms are dependent upon some disease or irritation of the nervous structures, chiefly of the brain. No treatment is required; in fact, a general convulsion must necessarily be self-limited in its duration. Suspending, as it does, respiratory movements, checking the oxygenation and decarbonization of the blood, the rapid accumulation of carbonic-acid gas in the blood and the exclusion of oxygen quickly puts the blood in a condition to produce the most reliable and speedy sedative effect upon the nerve excitability that could be found, and consequently furnishes its own remedy so far as the continuance of the convulsive paroxysm is concerned. Whatever treatment is instituted must be directed toward a removal of the cause of the convulsive paroxysm.

CHOREA, OR ST. VITUS' DANCE.

Chorea is characterized by involuntary contractions of voluntary muscles. This disease is an obscure disorder, which may be due to pressure upon a nerve, cerebral, or spinal sclerosis, small aneurisms in the brain, etc. Choreic symptoms have been produced by injecting granules of starch into the arteries entering the brain. Epilepsy and other forms of convulsions simulate chorea in appearance.

Stringhalt is by some termed chorea. This is manifested by a sudden jerking up of one or both hind legs when the animal is walking. This symptom may be very slight in some horses, but has a tendency to increase with the age of the animal. In some the catching up of the affected leg is very violent, and when it is lowered to the ground the motion is equally sudden and forcible, striking the foot to the ground like a pile driver. Very rarely chorea may be found to affect one of the fore legs, or the muscles of one side of the neck or the upper part of the neck. Involuntary jerking of the muscles of the hip or thigh is seen occasionally, and is termed "shivering" by horsemen.

Chorea is often associated with a nervous disposition, and is not so frequent in animals with a sluggish temperament. The involuntary muscular contractions cause no pain, and do not appear to produce much exhaustion of the affected muscles, although the jerking may be regular and persistent whenever the animal is in motion. In a few cases, early in the appearance of this affection, general nerve tonics may be of benefit, viz., iodide of iron, 1 dram; pulverized nux vomica, 1 dram; pulverized scutellaria, 1 ounce. Mix and give in the feed once a day for two weeks. Arsenic in the form of Fowler's solution is often beneficial. If the cause is connected with organic brain lesions, treatment is usually unsuccessful.

EPILEPSY, OR FALLING FITS.

The cause of epilepsy is seldom traceable to any special brain lesions. In a few cases it accompanies disease of the pituitary body, which is located in the under surface of the brain. Softening of the brain may give rise to this affection. Attacks may occur only once or twice a year or they may be of frequent recurrence. No premonitory symptoms precede an epileptic fit. The animal suddenly staggers; the muscles become cramped; the jaws may be spasmodically opened and closed, and the tongue become lacerated between the teeth; he foams at the mouth and falls down in a spasm. The urine flows away involuntarily, and the breathing may be temporarily arrested. The paroxysm soon passes off, and the animal gets on his feet in a few minutes after the return of consciousness. The treatment is dashing cold water on the head during the paroxysm. After the recovery, 1 dram of oxide of zinc may be given in his feed twice a day for several weeks, or benefit may be derived from the tonic prescribed for chorea.

PARALYSIS, OR PALSY.

Paralysis is a weakness or cessation of the muscular contraction, by diminution of loss of the conducting power or stimulation of the motor nerves. Paralytic affections are of two kinds, the complete and the incomplete. The former includes those in which both motion and sensibility are affected; the latter those in which only one or the other is lost or diminished. Paralysis may be general or partial. The latter is divided into hemiplegia and paraplegia. When only a small portion of the body is affected, as the face, a limb, the tail, it is designated by the term local paralysis. When the irritation extends from the periphery of the center it is termed reflex paralysis.

Causes.—They are very varied. Most of the acute affections of the brain and spinal cord may lead to paralysis. Injuries, tumors, disease of the blood vessels of the brain, etc., all have a tendency to produce suspension of the conducting motive power to the muscular structures. Pressure upon, or the severing of, a nerve causes a paralysis of the parts to which such a nerve is distributed. Apoplexy may be termed a general paralysis, and in nonfatal attacks is a frequent cause of the various forms of palsy.

General Paralysis.—This can not take place without producing immediate death. The term is, however, usually applied to paralysis of the four extremities, whether any other portions of the body are involved or not. This form of palsy is due to compression of the brain by congestion of its vessels, large clot formation in apoplexy, concussion, or shock, or any disease in which the whole brain structure is involved in functional disturbance.

Hemiplegia, or Paralysis of One Side, or Half, of the Body.—Hemiplegia is frequently the result of a tumor in the lateral ventricles of the brain, softening of one hemisphere of the cerebrum, pressure from extravasated blood, fracture of the cranium, or it may be due to poisons in the blood or to reflex origin. When hemiplegia is due to or the result of a prior disease of the brain, especially of an inflammatory character, it is seldom complete; it may affect only one limb and one side of the head, neck, or muscles along the back, and may pass off in a few days.

Symptoms.—In hemiplegia the attack may be very sudden and the animal fall down powerless to move one side of the body; one side of the lips will be relaxed; the tongue may hang out on one side of the mouth; the tail curved around sideways. An inability to swallow food and water may be present and often the urine dribbles away as fast as it collects in the bladder. Sensibility of the affected side may be entirely lost, or only partial; the limbs may be cold and sometimes unnaturally warm. In cases where the attack is not so severe the animal may be able to maintain the standing position, but will have great difficulty in moving the affected side. In such cases the animal may recover from the disability. In more severe cases, where there is complete loss of movement, recoveries are rare.

Laryngismus Paralyticus, or Roaring.—This condition is characterized by roaring, and is usually caused by an inflamed or hypertrophied bronchial gland pressing against the left recurrent laryngeal nerve, which interferes with its conducting power. A similar condition is occasionally induced in acute pleurisy, where the recurrent nerve becomes involved in the diseased process or compressed by plastic exudation.

Paralysis of the Rectum and Tail.—This is generally the result of a blow or fall on the rump, which causes a fracture of the sacrum bone and injury to the nerves supplying the tail and part of the rectum and muscles belonging thereto. This fracture would not be suspected were it not for the loss of motion of the tail.

Symptoms.—When due to mechanical injury of the spinal cord, from a broken back or spinal hemorrhage, it is generally progressive in its character, although it may be sudden. When it is caused by agents in the blood, it may be intermittent or recurrent. Paraplegia is not difficult to recognize, for it is characterized by a weakness and imperfect control of the hind legs and powerless tail. The urine usually dribbles away as it is formed, and the manure is pushed out, ball by ball, without any voluntary effort, or the passages may cease entirely. When paraplegia is complete, large and ill-conditioned sores soon form on the hips and thighs from chafing and bruising, which have a tendency to quickly weaken the animal and necessitate his destruction.

Locomotor Ataxia, or Incoordination of Movement.—This is characterized by an inability to control properly the movement of the limbs. The animal appears usually perfectly healthy, but when he is led out of his stall his legs have a wobbly movement, and he will stumble or stagger, especially in turning. When this is confined to the hind parts it may be termed a modified form of paraplegia, but often it may be seen to affect nearly all the voluntary muscles when they are called into play, and must be attributed to some pressure exerted on the base of the brain.

Local Paralysis.—This is frequently met with in horses. It may affect many parts of the body, even vital organs, and it is very frequently overlooked in diagnosis.

Facial Paralysis.—This is a frequent type of local paralysis, and is due to impairment of function of the motor nerve of the facial muscles, the *portico dura.* The cause may exist at the base of the brain, compression along its course after it leaves the medulla oblongata, or to a bruise after it spreads out on the great masseter muscle.

Symptoms.—A flaccid condition of the cheek muscles, pendulous lips, inability to grasp the food, often a slow and weak movement in chewing and difficulty and slowness in drinking.

Intestinal Paralysis.—Characterized by persistent constipation; frequently the strongest purgatives have no effect whatever on the movement of the bowels. In the absence of symptoms of indigestion, or special diseases implicating the intestinal canal, torpor of the bowels must be attributed to deficient innervation. This condition may depend upon brain affections or be due to reflex paralysis. Sudden checks of perspiration may induce excessive action of the bowels or paralysis.

Paralysis of the Bladder.—This usually affects the neck of the bladder, and is characterized by incontinence of urine; the urine dribbles away as fast as it is secreted. The cause may be of reflex origin, disease of the rectum, tumors growing within the pelvic cavity, injury to the spinal cord, etc.

Paralysis of the Optic Nerve, or Amaurosis.—A paralysis of eyesight may occur very suddenly from rupture of a blood vessel in the brain, acute local congestion of the brain, the administration of excessive doses of belladonna. In amaurosis the pupil is dilated to its full extent, the eye looks clear, but does not respond to light.

Paralysis of hearing, of the external ear, of the eyelid, partial paralysis of the heart and organs of respiration, of the blood vessels from injury to the vaso-motor nerves of the esophagus, or loss of deglutition, palsy of the stomach, all may be manifested when the supply of nervous influence is impaired or suspended.

Treatment for Paralysis.—In all paralytic affections there may be anesthesia, or impairment of sensibility, in addition to the loss of motion, or there may be hyperesthesia, or increased sensibility, in connection with the loss of motion. These conditions may call for special treatment in addition to that for loss of motion. Where hyperesthesia is well marked local anodynes may be needed to relieve suffering. Chloroform liniment or hypodermic injections of from 3 to 5 grains of sulphate of morphia will allay local pain. If there is marked anesthesia, or loss of sensibility, it may become necessary to secure the animal in such a way that he can not suffer serious injury from accidents which he can not avoid or feel. In the treatment of any form of paralysis we must always refer to the cause, and attempt its removal if it can be discovered. In cases where the cause can not be determined we have to rely solely upon a general external and internal treatment. Externally, fly blisters or strong irritant liniments may be applied to the paralyzed parts. In hemiplegia they should be applied along the bony part of the side of the neck, in paraplegia, across the loins. In some cases hot-water cloths will be beneficial. Internally, it is well to administer 1 dram of powdered nux vomica or 2 grains of sulphate of strychnia twice a day until twitching of some of the voluntary muscles occurs; then discontinue it for several days, and then commence again with a smaller dose, gradually increasing it until twitching recurs. Iodide of potash in 1 to 2 dram doses two or three times daily may be employed with the hope that it will favor the absorption of the clot or obstruction to the nervous current. In some cases Fowler's solution of arsenic in teaspoonful doses twice a day in the drinking water proves beneficial. Occasionally benefit may be derived from the application of the electric current, especially in cases of roaring, facial paralysis, paralysis of the eyelid, etc. Nutritious but not too bulky food, good ventilation, clean stabling, moderate exercise if the animal is capable of taking it, good grooming, etc., should be observed in all cases.

SPINAL MENINGITIS, OR INFLAMMATION OF THE MEMBRANES ENVELOPING THE SPINAL CORD.

Causes.—This may be induced by the irritant properties of blood poisons, exhaustion and exposure, spinal concussion, all forms of injury to the spine, tumors, caries of the vertebræ, rheumatism, etc.

Symptoms.—A chill may be the precursor, a rise in temperature, or a general weakness and shifting of the legs. Soon a painful, convulsive twitching of the muscles sets in, followed by muscular rigidity along the spine, in which condition the animal will move very stiffly and evince great pain in turning. Evidences of paralysis or paraplegia develop, retention or incontinence of urine, and oftentimes sexual excitement is present. The presence of marked fever at the beginning of the attack, associated with spinal symptoms should lead us to suspect spinal meningitis. These two conditions usually appear together, or myelitis follows inflammation of the meninges so closely that it is almost impossible to separate the two;

practically it does not matter much, for the treatment will be about the same in both cases. Spinal meningitis generally becomes chronic, and is then marked principally by paralysis of that portion, or parts of it, posterior to the seat of the disease.

Treatment.—Bags filled with ice should be applied along the spine, to be followed later on by strong blisters. The fever should be controlled as early as possible by giving 20 drops of Norwood's tincture of veratrum viride every hour until the desired result is obtained. One dram of the fluid extract of belladonna, to control pain and vascular excitement of the spinal cord, may be given every five or six hours until the pupils of the eyes become pretty well dilated. If the pain is very intense 5 grains of sulphate of morphia should be injected hypodermically. The animal must be kept as free from excitement as possible. If the urine is retained in the bladder it must be drawn off every four or six hours. In very acute attacks the disease generally proves fatal in a few days. If, however, the animal grows better some form of paralysis is apt to remain for a long time, and the treatment will have to be directed then toward a removal of the exudative products and a strengthening of the system and stimulation of the nervous functions. To induce absorption, iodide of potassa in 2-dram doses may be given, dissolved in the drinking water, twice a day. To strengthen the system, iodide of iron 1 dram twice a day and 1 dram of nux vomica once a day may be given in the feed. Electricity to the paralyzed and weakened muscles is advisable; the current should be weak, but be continued for half an hour two or three times daily. If the disease is due to a broken back, caries of the vertebræ, or some other irremediable cause, the animal should be destroyed at once.

MYELITIS, OR INFLAMMATION OF THE SUBSTANCE OF THE SPINAL CORD.

This is a rare disease, except as a secondary result of spinal meningitis or injuries to the spine. Poisoning by lead, arsenic, mercury, phosphorus, carbonic-acid gas, etc., has been known to produce it. Myelitis may be confined to a small spot in the cord or may involve the whole for a variable distance. It may lead to softening, abscess, or degeneration.

Symptoms.—The attack may begin with a chill or convulsions; the muscles twitch or become cramped very early in the disease, and the bladder usually is affected at the outset, in which there may be either retention or incontinence of urine. These conditions are followed by complete or partial paralysis of the muscles posterior to the locality of the inflamed cord, and the muscles begin to waste away rapidly. The paralyzed limb becomes cold and dry, due to the suspension of proper circulation; the joints may swell and become edematous; vesicular eruptions appear on the skin; and frequently gangrenous sloughs form on the paralyzed parts. It is exceedingly seldom that recovery takes place. In a few instances it may assume a chronic type, when all the symptoms become mitigated, and thus continue for some time, until septicemia or exhaustion causes death.

Pathology.—The inflammation may involve nearly the whole length of the cord, but generally it is more intense in some places than others; when due to mechanical injury, the inflammation may remain confined to a small section. The cord is swollen and congested, reddened, often softened and infiltrated with pus cells, and the nerve elements are degenerated. Treatment is similar to that of spinal meningitis.

SPINAL CONGESTION.

This condition consists in an excess of blood. As the blood vessels of the pia mater are the principal source of supply to the spinal cord, peremia of the cord and of the meninges usually go together. The symptoms are, therefore, closely allied to those of spinal meningitis and congestion. When the pia mater is diseased, the spinal cord is almost invariably affected also. Sudden checking of the perspiration, violent exercise, blows, and falls are the causes.

Symptoms.—The symptoms may vary somewhat with each case, and closely resemble the first symptoms of spinal meningitis, spinal tumors, and myelitis. First, some disturbance in movement, lowering of temperature, and partial loss of sensibility posterior to the seat of the congestion. If in the cervical region, it may cause interference in breathing and the action of the heart. When in the region of the loins, there may be loss of control of the bladder. When the congestion is sufficient to produce compression of the cord, paraplegia may be complete. Usually fever, spasms, muscular twitching, or muscular rigidity are absent, which will serve to distinguish spinal congestion from spinal meningitis.

Treatment.—Hot-water applications to the spine, 1-dram doses fluid extract of belladonna repeated every four hours, and tincture of aconite root 20 drops every hour until the symptoms become ameliorated. If no inflammatory products occur, the animal is likely to recover.

SPINAL ANEMIA.

This may be caused by extreme cold, exhausting diseases, spinal embolism or plugging of a spinal blood vessel, an interference with the circulation through the abdominal aorta, from compression, thrombosis, or aneurism of that vessel; the spinal vessels may be caused to contract through vaso-motor influence, a result of peripheral irritation of some nerve. Spinal anemia causes paralysis of the muscles used in extending the limbs. When the bladder is affected, it precedes the weakness of motion, while in spinal congestion it follows, and increased sensibility, in place of diminished sensibility, as in spinal congestion, is observed. Pressure along the spine causes excessive pain. If the exciting cause can be removed, the animal recovers; if this fails, the spinal cord may undergo softening.

SPINAL COMPRESSION.

When caused by tumors or otherwise, when pressure is slight, it produces a paralysis of the muscles used in extending a limb and contraction of those which flex it. When compression is great it causes complete loss of sensibility and motion posterior to the compressed part of the cord. Compression of a lateral half of the cord produces motor paralysis, disturbance of the circulation, and difficulty of movement, an increased sensibility on the side corresponding to the compressed section, and a diminished sensibility and some paralysis on the opposite side. When it occurs as a sequence of a preceding inflammatory disease, iodide of potassa and general tonics are indicated. When due to tumors growing within the spinal canal, or to pressure from displaced bone, no form of treatment will result in any benefit.

SPINAL HEMORRHAGE.

This may occur from changes in the wall of the blood vessels, in connection with tumors, traumatic injuries, etc. The blood may escape through the pia mater into the subarachnoid cavity, and large clots be formed.

Symptoms.—The symptoms are largely dependent upon the seat and extent of the hemorrhage, as they are principally due to the compression of the cord. A large clot may produce sudden paraplegia, accompanied by severe pain along the spine; usually, however, the paralysis of both motion and sensation is not very marked at first; on the second or third day fever is apt to appear, and increased or diminished sensibility along the spine posterior to the seat of the clot. When the bladder and rectum are involved in the symptoms it indicates that the spinal cord is compressed.

Treatment.—In the occurrence of injuries to the back of a horse, whenever there is any evidence of paralysis, it is always advisable to apply bags of ice along the spine to check or prevent hemorrhage or congestion, and 2 drams of the fluid extract of ergot and 20 drops of tincture of digitalis may be given every hour until three doses have been taken. Subsequently tincture of belladonna in half-ounce doses may be given three times a day. If there is much pain, 5 grains of sulphate of morphia, injected under the skin, will afford relief and lessen the excitability of the animal. In all cases the animal should be kept perfectly quiet.

SPINAL CONCUSSION.

This is rarely observed in the horse, and unless it is sufficiently severe to produce well-marked symptoms it would not be suspected. It may occur in saddle horses from jumping, or it may be produced by falling over an embankment, or a violent fall upon the haunches may produce it. Concussion may be followed by partial paralysis or spinal hemorrhage; generally, however, it is confined to a jarring and some disturbance of the nerve elements of the cord, and the paralytic effect which ensues soon passes off. Treatment consists in rest until the animal has completely recovered from the shock. If secondary effects follow from hemorrhage or compression, they have to be treated as heretofore directed.

SPINAL TUMORS.

Within the substance of the cord glioma or the mixed gliosarcomata are found to be the most frequent, tumors may form from the meninges and the vertebræ, being of a fibrous or bony nature, and affect the spinal cord indirectly by compression. In the meninges we may find cancers, and fibromata; and aneurisms of the spinal arteries have been discovered in the spinal canal.

Symptoms.—Tumors of the spinal canal cause symptoms of spinal irritation or compression of the cord. The gradual and slow development of symptoms of paralysis of one or both hind limbs or certain muscles may lead to a suspicion of spinal tumors. The paralysis induced is progressive, but not usually marked with atrophy of the muscles or increased sensibility along the spine. When the tumor is within the spinal cord itself all the symptoms of myelitis may be present.

Treatment.—General tonics and 1-dram doses of nux vomica may be given; iodide of iron or iodide of potassa in 1-dram doses, three times a day in feed, may, in a very few cases, give some temporary benefit. Usually the disease progresses steadily until it proves fatal.

NEURITIS, OR INFLAMMATION OF A NERVE.

This is caused by a bruise or wound of a nerve or by strangulation in a ligature when the nerve is included in the ligation of an artery. The changes in an inflamed nerve are an enlargement, reddening of the nerve sheath, spots of extravasated blood, and sometimes an infiltration of serum mixed with pus. The symptoms are acute pain of the parts supplied by the nerve and absence of swelling or increased heat of the part. Hypodermic injections of from 3 to 5 grains of morphia to relieve pain, hot fomentations, and rest, are the treatment. If it is due to an inclusion of a ligature, the nerve should be divided above and below the ligature.

NEUROMA, OR TUMOR OF A NERVE.

Neuroma may be from enlargement of the end of a divided nerve or due to fibrous degeneration of a nerve which has been bruised or wounded. Its most frequent occurrence is found after the operation of neurotomy for foot lameness, and it may appear after the lapse of months or even years. Neuroma usually develops within the sheath of the nerve with or without implicating the nerve fibers. It is oval, running lengthwise with the direction of the nerve. The symptoms are pain of the affected limb or part, which is manifested more especially after resting a while, and when pressure is made upon the tumor it causes extreme suffering. The treatment is excision of the tumor, including part of the nerve above and below, and then treat it like any other simple wound.

INJURIES TO NERVES.

These may consist in wounding, bruising, laceration, stretching, compression, etc. The symptoms which are produced will depend upon the extent, seat, and character of the injury. Recovery may quickly take place, or it may lead to neuritis, neuroma, or spinal or cerebral irritation, which may result in tetanus, paralysis, and other serious derangements. In all diseases, whether produced by some form of external violence or intrinsic causes, the nerves are necessarily involved, and sometimes it is to a primary injury of them that the principal fault in movement or change of nutrition of a part is due. It is often difficult or impossible to discover that an injury to a nerve has been inflicted, but whenever this is possible it may enable us to remedy that which otherwise would result in permanent evil. Treatment should consist in relieving compression, in hot fomentations, the application of liniments, excision of the injured part, and rest.

TETANUS, OR LOCKJAW.

This disease is characterized by spasms affecting the muscles of the face, neck, body, and limbs, and of all the muscles supplied by the cerebro-spinal nerves. The spasms or muscular contractions are rigid and persistent, yet mixed with occasional more intense contractions of convulsive violence.

Causes.—This disease is caused by a bacillus that is often found in the soil, in manure and in dust. The germ grows only in the absence of oxygen. It produces a powerful nerve poison, which causes the symptoms of tetanus. The germ itself multiplies at the point where it is introduced, but its poison is absorbed, and is carried by the blood to all parts of the body, and thus the nervous system is poisoned. Deep wounds infected by this germ are more dangerous than superficial wounds, because in them the germ is more remote from the oxygen of the air. Hence, nail pricks, etc., are especially dangerous. In the majority of instances the cause of tetanus can be traced to wounds, especially pricks and wounds of the feet or of tendinous structures. It sometimes follows castration, docking, the introduction of setons, inclusion of a nerve in a ligature, etc. It may come on a long time after the wound is healed—three or four months. In some countries where tetanus appears to be enzootic the presumption is that it is due to a specific germ. Horses with a nervous, excitable disposition are more predisposed than those of a more sluggish nature. Stallions are more subject to develop tetanus as the result of wounds than geldings, and geldings more than mares.

Symptoms.—The attacks may be acute or subacute. In an acute attack the animal usually dies within four days. The first symptoms which attract the attention of the owner is difficulty in chewing and swallowing, an extension of the head and protrusion over the inner part of the eye of the membrana nictitans, or haw. An examination of the mouth will reveal an inability to open the jaws to their full extent, and the endeavor to do so will produce great nervous excitability and increased spasm of the muscles of the jaw and neck. The muscles of the neck and along the spine become rigid and the legs are moved in a stiff manner. The slightest noise or disturbance throws the animal into increased spasm of all the affected muscles. The tail is usually elevated and held immovable; the bowels become constipated early in the attack. The temperature and pulse are not much changed. These symptoms in the acute type become rapidly aggravated until all the muscles are rigid—in a state of tonic spasm—with a continuous tremor running through them; a cold perspiration breaks out on the body; the breathing becomes painful from the spasm of the muscles used in respiration; the jaws are completely set, eyeballs retracted, lips drawn tightly over the teeth, nostrils dilated, and the animal presents a picture of the most extreme agony until death relieves him. The pulse, which at first was not much affected, will become quick and hard, or small and thready when the spasm affects the muscles of the heart. In the subacute cases the jaws may never become entirely locked; the nervous excitability and rigidity of the muscles are not so great. There is, however, always some stiffness of the neck or spine manifest in turning; the haw is turned over the eyeball when the nose is elevated. It is not uncommon for owners to continue such animals at their work for several days after the first symptoms have been observed. All the symptoms may gradually increase in severity for a period of ten days, and then gradually diminish under judicious treatment, or they may reach the stage wherein all the characteristics of acute tetanus become developed. In some cases, however, we find the muscular cramps almost solely confined to the head or face, perhaps involving those of the neck. In such cases we have complete lockjaw, and all the head symptoms are acutely developed. On the contrary, we may find the head almost exempt in some cases, and have the body and limbs perfectly rigid and incapable of movement without falling.

Tetanus may possibly be confounded with spinal meningitis, but the character of the spasm-locked jaw, retraction of the eyeballs, the difficulty in swallowing due to spasms of the muscles of the pharynx, and above all, the absence of paralysis, should serve to make the distinction.

Prevention.—Where a valuable horse has sustained a wound that it is feared may be followed by tetanus, it is well to administer a dose of tetanus antitoxin. This is injected beneath the skin with a hypodermic syringe. A very high degree of protection may in this way be afforded.

Treatment.—The animal should be placed in a box stall without bedding, as far away as possible from other horses. If in a country district, the animal should be put into an outbuilding or shed, where the noise of other animals will not reach him; if the place is moderately dark it is all the better; in fly time he should be covered with a light sheet. The attendant must be very careful and quiet about him, to prevent all unnecessary excitement and increase of spasm. Tetanus antitoxin appears to be useful as a remedy in some cases, if given in very large quantities early in the disease; otherwise it is useless. Subcutaneous injections of carbolic acid in glycerin and water (carbolic acid 30 grains, glycerin and water each 1 ounce) appear to be useful in some cases. Injections should be given twice daily.

A cathartic, composed of Barbados aloes 6 to 8 drams, with which may be mixed 2 drams of the solid extract of belladonna, should be given at once. This is best given in a ball form; if, however, the animal is greatly excited by the attempt or can not swallow, the ball may be dissolved in 2 ounces of olive oil and thrown on the back of the tongue with a syringe. If the jaws are set, or nearly so, an attempt to administer medicine by the mouth should not be made. In such cases one-quarter of a grain of atropia, with 5 grains of sulphate of morphia, should be dissolved in 1 dram of pure water and injected under the skin. This should be repeated sufficiently often to keep the animal continually under its effect. This will usually mitigate the severity of the spasmodic contraction of the affected muscles and lessen sensibility to pain. Good results may be obtained sometimes by the injection per rectum of the fluid extract of belladonna and of cannabis indica, of each 1 dram, every four or six hours. This may be diluted with a quart of milk. When the animal is unable to swallow liquids, oatmeal gruel and milk should be given by injection per rectum to sustain the strength of the animal. A pailful of cool water should be constantly before him, placed high enough for him to reach it without special effort; even if he can not drink, the laving of the mouth is refreshing. Excellent success frequently may be obtained by clothing the upper part of the head, the neck, and greater part of the body in woolen blankets kept saturated with very warm water. This treatment should be continued for six or eight hours at a time. It often relaxes the cramped muscles and gives them rest and the animal almost entire freedom from pain; but it should be used every day until the acute spasms have permanently subsided in order to be of any lasting benefit.

Recently subcutaneous injections of brain emulsion have been recommended. It is thought that the tetanus toxin will attach itself to the brain cells so injected and thus free the system of this poison. When it is due to a wound, the wound should be thoroughly cleaned and disinfected with carbolic acid. If from a wound which has healed, an excision of the cicatrix may be beneficial. In all cases it is not uncommon to have a partial recovery followed by relapse when the animal becomes excited from any cause.

PLUMBISM, OR LEAD POISONING.

This disease is not of frequent occurrence. It may be due to habitually drinking water which has been standing in leaden conductors or in old paint barrels, etc. It has been met with in enzootic form near smelting works, where, by the fumes arising from such works, lead in the form of oxide, carbonate, or sulphate was deposited on the grass and herbage which the horses ate.

Symptoms.—Lead poisoning produces derangement of the functions of digestion and locomotion, or it may affect the lungs principally. In whatever system of organs the lead is deposited mostly there will we have the symptoms of nervous debility most manifest. If in the lungs, the breathing becomes difficult and the animal gets out of breath very quickly when he is compelled to run. Roaring, also, is very frequently a symptom of lead poisoning. When it affects the stomach, the animal gradually falls away in flesh, the hair becomes rough, the skin tight, and colicky symptoms develop. When the deposit is principally in the muscles, partial or complete paralysis gradually develops. When large quantities of lead have been taken in and absorbed, symptoms resembling epilepsy may result, or coma and delirium develop and prove fatal. In lead poisoning there is seldom any increase in temperature. A blue line forms along the gums of the front teeth, and the breath assumes a peculiarly offensive odor. Lead can always be detected in the urine by chemical tests.

Treatment.—The administration of 2-dram doses of iodide of potassa three times a day. This will form iodide of lead in the system, which is rapidly excreted by the kidneys. If much muscular weakness or paralysis is present, sulphate of iron in 1-dram doses and strychnia in 2-grain doses may be given twice a day. In all cases of suspected lead poisoning all utensils which have entered into the supply of feed or water should be examined for the presence of soluble lead. If it occurs near lead works, great care must be given to the supply of uncontaminated fodder, etc.

FORAGE POISONING, OR SO-CALLED CEREBRO-SPINAL MENINGITIS.

This disease prevails among horses in nearly all parts of the United States. It is most common in Maryland, Delaware, Virginia, North Carolina, New Jersey, Pennsylvania, New York, Kansas, Missouri, Illinois, Indiana, and Ohio. Certain localities are visited by it almost every year. This condition consists in a poisoning and depression of the nervous system from eating or drinking food or water containing poison generated by mold or bacteria. It has been shown to be due to eating damaged ensilage, corn, brewers' grains, oats, etc., or to drinking stagnant pond water or water from a well contaminated by surface drainage. Horses at pasture may contract this disease when the growth of grass is so profuse that it mats together and the lower part dies and ferments or becomes moldy.

In England a similar disease has been called grass staggers, due to eating rye grass when it is ripening or when it is cut and eaten while it is heating and undergoing fermentation. In eastern Pennsylvania it was formerly known by the name of putrid sore throat and choking distemper. A disease similar in many respects, which is very prevalent in Virginia, especially along the eastern border, is commonly known by the name of "blind staggers," and in many of the Southern States has been attributed to the consumption of worm-eaten corn. Horses of all ages and mules are subject to this disease.

Symptoms.—The symptoms which typify sporadic, or epidemic, cerebro-spinal meningitis in man are not witnessed among horses, namely, excessive pain, high fever, and early muscular rigidity. In the recognition of the severity of the attack we may divide the symptoms into three grades. In the most rapidly fatal attacks the animal may first indicate it by weak, staggering gait, partial or total inability to swallow solids or liquids, impairment of eyesight; twitching of the muscles, and slight cramps may be observed. As a rule, the temperature is not elevated—indeed, it is sometimes below normal. This is soon followed by a paralysis of the whole body, inability to stand, delirium in which the animal sometimes goes through a series of automatic movements as if trotting or running; the delirium may become very violent and the animal in his unconsciousness may bruise his head in his struggles very seriously, but usually a deep coma renders him quiet until he expires. Death in these cases usually takes place in from four to twenty-four hours from the time the first symptoms become manifest. The pulse is variable during the progress of the disease; it may be almost imperceptible at times, and then again very rapid and irregular; the respirations generally are quick and catching. In the next form in which this disease may develop it first becomes manifest by a difficulty in swallowing and slowness in mastication, and a weakness which may be first noticed in the strength of the tail; the animal will be unable to switch it or to offer resistance when we bend it up over the croup. The pulse is often a little slower than normal. There is no evidence of pain; the respirations are unchanged, and the temperature little less than normal; the bowels may be somewhat constipated. These symptoms may remain unchanged for two or three days and then gradual improvement take place, or the power to swallow may become entirely lost and the weakness and uncertainty in gait more and more perceptible; then sleepiness or coma may appear; the pulse becomes depressed, slow, and weak, the breathing stertorous, and paroxysms of delirium develop, with inability to stand, and some rigidity of the spinal muscles or partial cramp of the neck and jaws. In such cases death may occur in from six to ten days from the commencement of the attack. In many cases there is no evidence of pain, spasm, or fever at any time during the progress of the disease, and finally profound coma develops and death follows, painless and without a struggle.

In the last or mildest form the inability of voluntary control of the limbs becomes but slightly marked, the power of swallowing never entirely lost, and the animal has no fever, pain, or unconscious movements. Generally the animal will begin to improve about the fourth day and recovers.

In a few cases the spinal symptoms, manifested by paraplegia, may be the most prominent symptoms; in others they may be altogether absent and the main symptoms be difficulty in mastication and swallowing; rarely it may affect one limb only. In all cases where coma remains absent for six or seven days the animal is likely to recover. When changes toward recovery take place, the symptoms usually leave in the reverse order in which they developed, but local paralysis may remain for some time, rarely persistent.

One attack does not give immunity, for it may recur at some later time and prove fatal. Horses have been known to pass through three attacks, being affected for a week or longer each time.

Treatment.—In the worst class of cases treatment is very seldom successful, and it is dangerous to attempt the administration of medicine by the mouth, on account of the inability of the animal to swallow. If the condition of the animal will admit of a drench, give 4 to 6 ounces of whisky in 2 pints of milk; the inhalation of ammonia vapor from a sponge saturated with dilute aqua ammonia may arouse consciousness.

In the second class of cases a purge should always be given, and the further treatment recommended is to give strychnia in 2-grain doses twice or three times daily. If there is twitching of the shoulder muscles or gnashing of the teeth, this should be discontinued. The strength of the heart should be kept up with carbonate of ammonia or whisky. When the animal is unable to swallow, one-fourth grain doses of sulphate of atropia may be injected under the skin every four, six, or eight hours, as the case may demand. The atropia is a heart stimulant, increases capillary circulation, and quiets pain and excitability. When the most prominent symptoms abate give such food as they may be able to eat, and keep fresh, cool water constantly before them, supporting them in slings if necessary; clean stabling and plenty of fresh air are of the utmost importance.

Hygienic Measures Needful.—Whenever this disease appears in a stable all the animals should be removed as soon as possible. They should be provided with clean, well-ventilated, and well-drained stables, and each animal should receive a laxative and be fed food and given water from a new, clean source. The abandoned stable should be thoroughly cleansed from all waste matters, receive a coat of whitewash containing 4 ounces of carbolic acid to the gallon of water, and should have time to dry thoroughly before the horses are replaced. A complete change of food is of the very greatest importance, on account of the belief that the cause resides in diseased grain, hay, and grass.—(Spl. Rpt. Horse, Dept. Agr. 1911; B. A. I. Cir. 122, 1908; Kans. E. S. B. 24, 173; La. E. S. B. 106; Md. E. S. 53, 80. Among the distinguished writers of the bulletins from which the foregoing article on Horse Diseases has been abridged or taken bodily are the following: Leonard Pearson, B. S., V. M. D.; C. B. Michener, N. S.; R. S. Huide Koper, V. M. D.; John R. Mohler, V. M. D.; W. H. Harbaugh, V. S.; James Law, F. R. C. V. S.; A. A. Holcombe, D. V. S.; A. Liantard, M. D., V. M.; M. R. Trumbower, V. S., and others.)

PART II

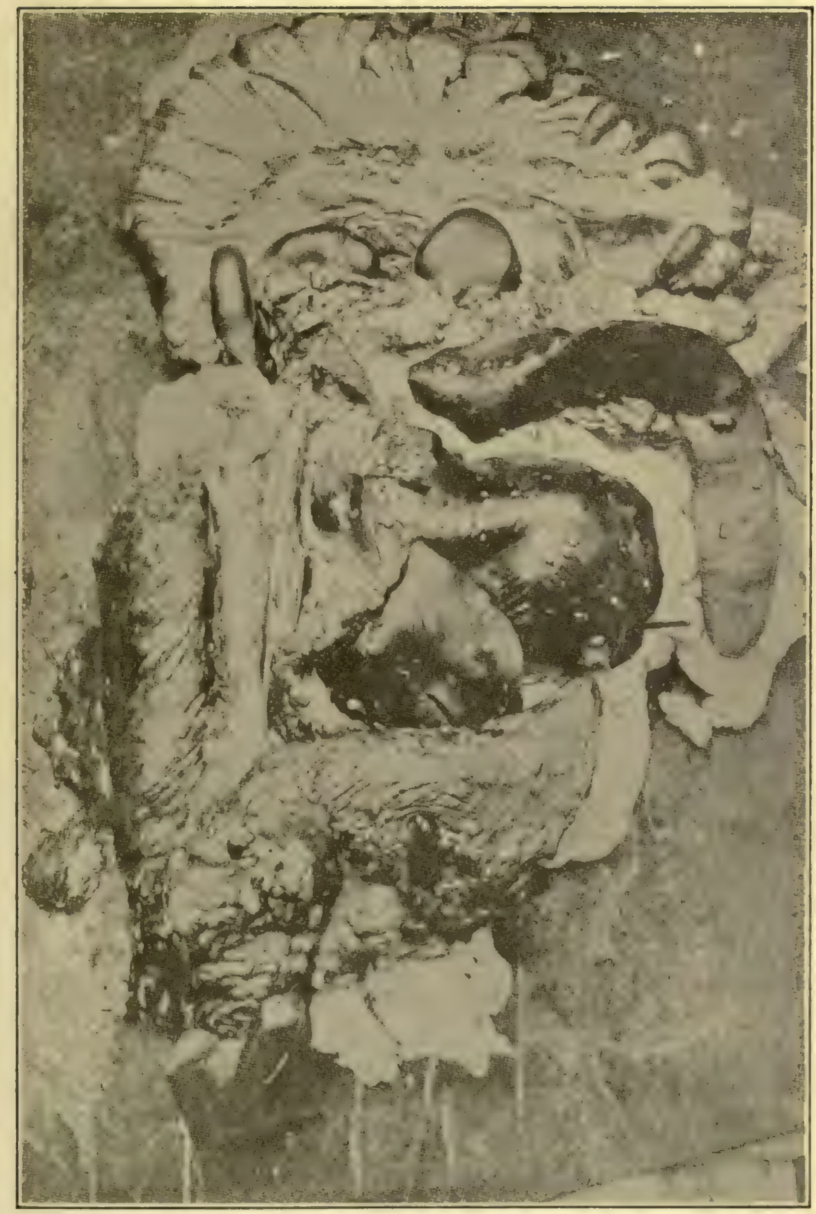
DISEASES OF SWINE.

KINDS AND CAUSES OF DISEASE.

AS A MATTER of convenience and to aid in understanding diseases, they are here divided into three classes: (1) sporadic, (2) contagious, and (3) infectious. This classification is purely arbitrary and is based upon the nature of the cause. It is believed that this classification will be better understood than those given by many writers whose arrangement is more complex.

Sporadic.—Sporadic diseases are those which have no one constant cause. A variety of causes may produce the same disease. Colic, diarrhœa, rheumatism, colds, etc., are types of sporadic diseases. Colic for example may be caused by a change of food, by green food, by spoiled food, by watering when the animal is too warm, by contaminated water, by drugs, by exhaustion, by exposure, by intestinal worms, etc. There is no single cause for colic, colds or any other sporadic disease. In sporadic diseases, the disease can not be conveyed from one animal to another as there is no specific germ or other organism acting. If several animals are affected alike at the same time, it is because all have been subjected to like causes and not because it has spread from one to another. As a rule, only one or a few animals of a stable, herd or flock are affected at one time and there is no tendency to spread.

Contagious Diseases.—These are always produced by the same cause, and the causative factor may be communicated from one animal to another of the same species, or in some cases to animals of different species. When we speak of strictly contagious diseases, we usually have reference to those due to germs, or animal life that are normally parasitic and do not live or multiply outside the body, and which require comparatively close contact in order to spread. Distance, or a comparatively short time between the coming of animals to the same place are sufficient to prevent the spread. In other words, the germ does not pass an indefinite distance between the animals or live for a long time outside the animal's body. As examples of this type of disease, we have sheep scab, tape worms, glanders, pleuro pneumonia, etc. In the case of sheep scab the cause is always the scab mite; it can not travel alone and will not live in the pens, in the cars, on the fences or other objects with which the diseased sheep may come in contact for a long time. Therefore sheep separated by a roadway, or flocks using the pens where diseased sheep have been some months prior do not become



TUBERCULOSIS OF HOG, INVOLVING LUNGS, LIVER, SPLEEN, AND INTESTINES. Y. B. 1909.

affected. Pleuro pneumonia in cattle is also a contagious disease and at one time had a foothold in this country. It is a disease in which the germ does not live long outside the body and is only carried by contact or artificial means. It was eradicated by destroying all that were affected and disinfecting the places where it had been. Glanders among horses is also contagious and it is only spread by contact or close association. All strictly contagious diseases are controllable and could be exterminated by united effort. The drastic measures used to stamp out pleuro pneumonia would stamp out sheep scab in a short time.

Infectious Diseases.—These are caused by some special agent or parasite and the cause may live and multiply outside the body. Infectious diseases may be and frequently are contagious. Some infectious diseases however are not contagious. The line separating contagious and infectious diseases is not very clear. The distinction is largely one of degree. Among the types of infectious diseases we have lumpy jaw and blackleg of cattle; distemper and influenza of horses; cholera and swine plague in hogs, and roup in poultry. True lumpy jaw of cattle is always caused by ray fungus. The fungus is obtained upon the food which the animal takes, the disease is rarely spread by the discharges from the wound. Blackleg is obtained from the pasture or forage, the germs being known to live for a long time outside of the body. Influenza and strangles occur in epidemics because the germs live outside of the body and under favorable climatic conditions develop generally, thus causing widespread outbreaks at the same time. Hog cholera and swine plague are both infectious and contagious, the germs live outside the body and no amount of separation of herds will ever stamp out the diseases. It only decreases the number of cases. The germs of tetanus or lock jaw are to be found growing in the soil, but do not cause trouble unless accidentally introduced into a closed wound. Infectious diseases can not be wholly controlled because the occurrence in an animal is not essential to the life of the germ. Some may be prevented by vaccination, as blackleg, and some have been greatly reduced by learning the habitat of the germs outside of the body and making those places uncongenial for their growth.—(Ind. B. 100.)

CAUSES OF DISEASE.

The causes of disease are the indirect or predisposing causes and the direct or exciting causes. The predisposing causes are any factors which tend to render the body more susceptible or to favor the presence of the exciting cause. The exciting cause is the specific agent or thing that induces the diseases. To illustrate, an animal having a narrow, pinched chest may be in health but when subjected to the same conditions as its companions, it contracts disease while they do not. The lessened lung capacity has rendered the animal susceptible. Hogs pastured on high dry ground and fed on clean feeding floors are generally free from intestinal worms, while hogs pastured upon low wet ground and fed in the mud are frequently infested with worms. In the first case the predisposing cause was in the animal, in the second, it was in the surroundings. Among the causes of disease we may briefly consider the following:

Age.—Young animals are more subject to attacks of contagious or infectious diseases than old. White scours, suppurative joint disease, and infectious sore mouths are diseases of the first few days or weeks. Thumps occur early. Cholera occurs with much greater virulence in those under six months of age than in the older. Lung worms or whooping cough occurs between two and four months. Swine plague attacks the older hogs. Trichinæ likewise more often occurs in mature animals. As a rule, the young are more subject to acute diseases and the old to chronic troubles. The matter of sex has little bearing on the diseases of swine other than those due to farrowing.

Breed.—The matter of breed is of less importance in the diseases of swine than in other domestic animals. Some breeds are more active than others and thereby seem to have increased resistive powers to some troubles. For example, pigs from the more active breeds seldom have thumps if allowed to exercise. It is the lazy, fat fellows that are particularly susceptible.

Care and Feeding.—Care and feeding are factors of great importance. The feeding of unsuitable foods, as city swill, dirty, sour slop, those containing large quantities of soap, feeding too heavily when too young, feeding full rations of green corn as soon as it is ready, feeding cotton seed, feeding with too limited exercise, pasturing upon clover sod where there are many grub worms and upon land known to be infected with parasites, are all factors contributing to some forms of disease.

Shelter.—Sudden changes of temperature, extremes of heat and cold, exposure to storms, etc., all have their effect. Piling under straw stacks and hot sheds predisposes to pneumonia. Lying in damp beds causes skin troubles. The hog does not need a great deal of shelter, but needs that dry and comfortable.

Location.—Sometimes the difference of a few rods makes the difference between having disease in a herd and not having it. A dry, protected site is always preferable to one in the open or low.

Water Supply.—The work of this Station has been such as to prove that only well water, deep well water from a tubular well, can be recommended for all kinds of farm animals. This applies with possibly greater force to the hog than to any other class because cholera, a water borne disease, is the principal scourge. In actual practice, however, the reverse condition prevails.

Previous Disease.—The effect of one attack of an infectious disease as a rule confers immunity against a subsequent attack. This is not true of all, but of many. One attack of cholera will not give complete immunity, but does reduce the chances of a second attack. The effect of one disease may weaken a part and make the animal susceptible to some other trouble, as lung worms make it easy to acquire pneumonia.

Vital Causes.—The vital causes are all living organisms, either plant or animal, that act as parasites at any stage of their existence.

They may be either accessory or direct causes. The animal parasites are lice, intestinal worms, flukes, trichina, etc. The plant parasites are nearly all bacteria; the cause of cholera, swine plague, scours, joint disease, sore mouth, etc. They may act as accessory causes, as the lung worm may prepare the way for pneumonia, or directly cause it, as in the case of the cholera germ.—(Ind. B. 100.)

SYMPTOMS AND DIAGNOSIS.

In examining a hog the behavior, appearance, general conditions and surroundings must all be taken into consideration.

The grouping of symptoms into signs of disease is not as difficult in the hog as it is in some of the other farm animals, but in order to recognize any deviation from the normal, we must be familiar with the habits of the animal, the structure and the physiological functions of the body, or at least possess a practical knowledge of these things. Swine breeders have plenty of opportunity to learn this from personal observation; without this knowledge it is not possible to care for, or treat hogs in an intelligent manner when sick. The general symptoms, those affecting the entire system, inform us as to the condition of the animal at the outset and during the progress of a disease. Thus we have the symptoms connected with (a) the pulse; (b) the respiration; (c) the body temperature; (d) the mucous membranes; (e) the surface of the body; (f) the secretions and excretions; and (g) the nervous system. All of the general symptoms manifested by the hog are seldom considered either in the diagnosis or the treatment of disease. There is no reason, however, when treating valuable stock hogs, why a full knowledge of the condition of the animal should not be of the same importance as in the treatment of other domestic animals, and if possible this should be obtained.

Pulse.—The pulse can be easily taken in the hog from the femoral artery on the inner side of the thigh. The artery crosses this region in an oblique direction and is quite superficial toward the anterior (forward) and lower part. The normal number of pulse beats per minute is usually estimated at about seventy or eighty. In young pigs, and when the animal is exercised or excited, the rate is much higher. The following varieties of pulse are recognized in disease: frequent or infrequent, quick or slow, large or small, hard or soft and regular or intermittent. The frequency of the pulse has reference to the number of pulsations per minute; quick or slow to the time required for the pulse wave to pass under the finger; large or small, to the volume of blood that passes at each beat; hard or soft to the sense of feeling while the blood is passing under the fingers; and regular or intermittent to the intervals between the beats. There may be a number of beats regular and in time and then the missing of one or two, or there may be increased rapidity of a few beats and then a decrease. The condition of the circulation may also be judged by placing the hand on the left side of the chest and as nearly over the heart as possible.

Respiration.—The number of respirations per minute is subject to considerable variation. When at rest, they will vary from ten to twenty; if warm or excited and during exercise, from sixty to about one hundred. In hogs, normal respirations are frequently accompanied by respiratory sounds. In disease the respirations may be quickened and their character changed, as in pleurisy, peritonitis, pneumonia, etc. In the abdominal form of respiration, the movements of the walls of the chest are limited. This occurs in pleurisy. In the thorascic form of respiration the abdominal wall is held rigid and the movement of the walls of the chest make up for the deficiency. This latter condition is seen in peritonitis.

In inflammation of the air passages and irritation from dust or parasites, the secretions from the lining membranes are modified and there is usually sneezing or coughing. In the different diseases of the respiratory organs, the modified sounds are of much value in the diagnosis and in indicating the progress.

Temperature.—The body temperature is taken per rectum, the ordinary fever thermometer being used. The normal temperature of a hog will vary from 100.5 to 105 degrees Fahrenheit, the average being about 103. In order to determine the normal, it is well to take that of some of the other animals in the pen and make a comparison. Exercise and warm pens will increase body temperature, cold weather and drinking cold water will lower it.

Mucous Membrane.—In health the visible mucous membranes are usually a pale reddish color, and when inflamed they are a bright red. In collapse, internal hemorrhage, impoverished or bloodless conditions of the body the membranes are pale. In indigestion, that lining the mouth may appear coated; if irritated, excessively moist; and if the hog is feverish, dry. In serious diseases, especially febrile disturbances, secretions may accumulate around the margins of the eyelids and the eyes appear dull.

Skin.—Healthy hogs should have a smooth, rather heavy, glossy coat and the skin feel mellow and soft. When the skin loses its elasticity, becomes hard, rigid and scurvy and the hair rough and harsh, it indicates a lack of nutrition and an unhealthy condition of the body. When the coat is thin or the hog affected with external parasites, irritation from the sun and parasites may cause it to become greatly changed.

Excretions.—The character of the excretions from the kidneys and bowels become modified in some diseases, and should be considered in making a diagnosis.

Nervous System.—The state of the nervous system is indicated by dullness, excitability, or delirium. The hog may stagger, walk stiffly, drop the head, turn the head to one side, walk in a circle, have convulsions or show paralysis of a part of the whole body, as a result of nerve involvement. These symptoms may occur as an involvement in several diseases, or arise from primary affections of the nervous system.—(Ind. B. 100.)

GIVING MEDICINE.

The different methods of giving medicine are as follows: (a) by way of the mouth, in the feed or as a drench; (b) by injection into the tissues beneath the skin; (c) by rubbing into the skin; (d) by the air passages and lungs; (e) by the rectum.

By the Mouth.—Hogs possess a rather simple digestive tract, and are very susceptible to the action of drugs when given in the feed or as a drench. If the hog is not too sick to eat and the drug does not possess an unpleasant taste, it can be given in the feed. If soluble, milk can be used; if insoluble, ground feed is to be preferred. In all cases the medicine must be well mixed with the feed. When a large number are to be dosed it is best to separate them into lots of ten and feed each lot separately. When this is done, there is greater certainty of each getting the proper dose and the danger from overdosing is avoided. In the case of young pigs, we can take advantage of the fact that some drugs are excreted in the milk, and administer the drug to the mother. Drenching a hog is not difficult if quietly and easily managed. A large herd can be drenched quite rapidly if driven into a small pen, as the hogs will be in such close quarters that they can not get away. To secure the hog while drenching it, a noose of sash cord or a small rope can be placed around the upper jaw well back toward the angles of the lips, and the medicine administered with a metallic dose syringe. Sometimes when the drench is bulky, and the hog hard to hold, it is necessary to elevate the head and raise the fore feet off the ground. For this purpose a pulley and a rope wire stretcher is recommended. It should be hung in some convenient place in the pen and the animal secured in the usual way by placing a noose over the upper jaw. The rope is then thrown over the hook in the lower pulley and the hog drawn up until it is almost off its feet. The drench must not be administered until the hog is quiet and well under control, as there is some danger of the medicine getting into the air passages and doing harm. If there is danger of the hogs getting mixed in the operation, as soon as one is drenched it can be marked with paint.

Drugs, when soluble, are best given in water or milk; when insoluble, in syrup or oil. Instead of a syringe a long necked bottle, or a funnel with rubber tubing and an iron nozzle can be used.

Injecting Beneath the Skin.—This method of administration is suitable when the drug is non-irritating, the dose small and when prompt, energetic effects are required. The needle and hypodermic syringe should be sterile, and the place of injection washed with an antiseptic wash in order to prevent the formation of an abscess. The point of injection should be where the skin is thin, as the flank, belly, ear, or inside of thigh. The needle is introduced through the skin and the medicine injected beneath it by slowly pushing the piston. In the case of fat hogs the injection should go into the muscular tissue; otherwise it will not be absorbed promptly.

By the Air Passages and Lungs.—This method of administration is practiced but little, and usually for a local effect on the respiratory organs only. The hog or hogs are put into a tight enclosure and allowed to inhale vapors of the drug. Drugs suitable for this purpose are turpentine, creolin, eucalyptol, sulphur, etc. Turpentine is the one most used and is easily disseminated by pouring on hot water or by putting an ounce or two on hot bricks. Care must be exercised when treating hogs in this way, as they may suffer from lack of air.

By the Rectum.—Enemas or clysters are usually given for a local effect on the rectum or to accelerate the action of a purgative. To administer an enema a fountain syringe is best. The nozzle of the syringe should be smeared with vaseline before introducing it into the rectum. When the injection is large, it is well to elevate the hind parts of the hog. A gallon or more can be introduced into the intestines in this way. A funnel and rubber tubing, or an ordinary syringe can be used for this purpose.—(Ind. B. 100.)

SPORADIC DISEASES.

CANKER, SORE MOUTH.

The loss of little pigs from this disease annually is extensive, but largely might be prevented by proper care. The cause of the disease is infection of slight scratches of the nose, mouth, tongue and gums by the *bacillus necrophorus.* This germ is present normally in the intestines of hogs and may be found wherever their voidings have dropped. The disease, therefore, is most likely to attack pigs kept in unsanitary buildings and yards and the contagion lurks there from year to year. The sharp teeth of new born pigs cause lacerations when the animals play and fight and the cuts and scratches becoming infected by the germs derived from the filth of the floors and the soiled udders of the sow develop the eating canker sores or ulcers of the disease.

To prevent the disease, sows and pigs should be provided with clean pens and yards. Provide clean bedding, keeping it fresh and dry. Pens should be cleaned out often and yards kept free from accumulations of filth. Disinfectants and land plaster (gypsum) should be freely used in the pens daily. At birth the sharp teeth of each pig should be carefully nipped off with pincers, but more harm than good may follow if the gums are cut or bruised when operating. Treat the disease by scraping each ulcer thoroughly, and then rubbing it lightly with a lunar caustic pencil. Afterward swab the affected parts twice daily with a 5 per cent solution of permanganate of potash. If lumps or boils form upon the snout, cut deeply into each with a sharp knife, and at once saturate with tincture of iodine. Repeat the application once daily and each other day apply iodine tincture to the ulcers in place of the permanganate solution.

In mild cases good results have followed sousing the heads of affected pigs over and over again daily in a solution of one or two ounces of permanganate of potash in one gallon of warm water.—(Wis. B. 184.)

Causes.—Putrid or decomposing slops, irritating or hot foods, drenches, water in foul wallows, especially that containing seepage from the manure pile. Decayed teeth, irritation from awns or beards of grasses, as barley and wheat, in the feed, and rope loops used in catching hogs may also cause it.

Symptoms.—The mucous membrane of the mouth is hot, dry and red in appearance. Ropy saliva dribbles from the corners. The animal champs the jaws and seems to find relief in running its nose into cold water. There is a disagreeable odor from the mouth. Mastication is painful and the hog shows a disposition to eat sparingly. Soft liquid food is preferred; hard food is imperfectly masticated and may drop from the mouth. Recovery usually takes place in a few days.

Treatment.—If due to irritating foods, the cause must be removed. Hard food should be withheld and nothing but sloppy foods be fed to the animal when in this condition. Plenty of cool, clean water should be placed where the hog can drink and run its nose into it. The medicinal treatment consists in washing the mouth twice a day with an astringent wash or antiseptic lotion. A four per cent. watery solution of boric acid or alum can be used for this purpose. The coal tar washes are also serviceable.—(Ind. B. 100.)

DISEASED TEETH.

The hog eats all sorts of objects and cracks nuts, coal, gravel, etc., upon the teeth, so that when the hog becomes old he is almost sure to have a bad mouth. Hogs sold for stock purpose are seldom affected in this way. Boars sometimes have very long tusks.

Symptoms.—The symptoms of some derangement of the teeth are pain upon grinding, holding the head to one side while eating, insufficient mastication, as seen in the half or whole grain passed, and inability to shell corn from the ear.

Treatment.—The treatment is to give largely ground or sloppy food, and pasture. Cut off with dentist's cutters all long tusks, but do not knock them out with a punch or cold chisel, as the latter method is almost certain to crack the teeth and fracture the jaw.—(Ind. B. 100.)

BLACK TEETH.

This condition is frequently brought to the attention of the veterinarian, but as yet we have no satisfactory explanation to offer for their presence. They are also found in health, as may be observed in heads at the slaughter house. Undoubtedly too much stress has been laid upon this condition. We are not inclined to attribute any disease to this condition upon the present evidence. In very young pigs, when this condition is most frequently seen, there may be very long, sharp teeth present which it would be better to cut off. At the time of dentition, the temporary tooth may be present as a dark shell and the gums be made sore and cause the pig to hold the mouth open, to salivate, and to refuse food.—(Ind. B. 100.)

DEPRAVED APPETITE.

Causes.—Depraved appetite is due to a variety of causes and may occur, as a symptom in different diseases. Faulty rations, especially if deficient in alkaline and earthy salts, lack of exercise, digestive disorders and a nervous condition may cause it.

Symptoms.—The hog shows an inclination to eat all sorts of indigestible substances, earth, sand, feces, bristles, rotten wood, etc. Sometimes they are quarrelsome and may attack one of their number and kill it. Sows will eat their young, usually at the time of birth. When thus affected they do not thrive as they should and may become quite thin.

Treatment.—The treatment is chiefly preventive, and consists in supplying to the ration whatever elements are wanting. The addition of charcoal, salt, wood ashes, etc., sometimes answer the purpose well when the other ingredients seem to be about right. When the affection is due to chronic indigestion, they should be given the proper treatment.—(Ind. B. 100.)

ACUTE INDIGESTION.

Causes.—Overloading the stomach and spoiled foods, especially putrid swill, are common causes of indigestion. Alkaline washing powders and soaps irritate the stomach and intestines and may bring about this condition. Poor care, exposure and intestinal worms may also cause it.

Symptoms.—The hog refuses food, is generally restless and may have colicy pains. It usually wanders off by itself, acts dull, grunts, lies down in a quiet place or stands with the back arched and abdomen held tense. It seems to like to hide itself in the bedding, litter around the manure heap or straw stack, and in the grass or weeds. When vomiting occurs early in the attack, recovery usually takes place in a short time. Sometimes the animal has a diarrhea. The body temperature may be higher than normal.

Treatment.—Feeds that will irritate the stomach or intestines should be avoided. It is desirable to induce vomiting as soon as possible by giving an emetic of ipecacuan, (twenty or thirty grains in a little warm water). This can be followed by two or three ounces of castor oil. The hog should be kept in the pen and fed on easily digested ration.—(Ind. B. 100.)

CHRONIC INDIGESTION.

Causes.—When the causes of acute indigestion act for some time either in an intermittent or continuous manner, it will terminate in the chronic form.

Symptoms.—In the beginning these may be the same as in the acute form. The hog presents an unthrifty appearance and may become quite thin. Pigs grow slowly and may become badly stunted. We may observe constipation and diarrhea alternating.

Treatment.—Clean quarters and a well balanced, easily digested ration should be provided. The hog should have access to plenty of common salt and charcoal. As a tonic the following mixture can be given in the feed: bicarbonate of soda (two ounces), powdered gentian (three drams), sulphate of soda, (three ounces). The dose is about one teaspoonful twice daily. To check the diarrhea, give nitrate of bismuth in dram or half dram doses. If constipated, a cathartic of calomel (ten to twenty grains) will give relief.—(Ind. B. 100.)

INFLAMMATION OF STOMACH AND INTESTINES.

Inflammation of the stomach cannot be readily distinguished from that of the intestines and vice versa. Frequently both are inflamed at the same time. It is therefore more convenient to discuss both under this head.

Causes.—This disease is largely due to unhygienic conditions. Some people seem to think that a hog can eat anything and take poison with impunity, and as a result, it frequently suffers from ignorant practice in the feeding, care, and giving of drugs. The causes of gastro-enteritis are much the same as in indigestion, only they act more intensely. We must especially mention dirty, filthy yards and pens, decomposed and over-kept foods. When hogs are kept in filthy quarters, the snout and food become soiled with all sorts of microbes. These enter the digestive tract along with the food, irritate the lining membrane and pave the way for those germs that would otherwise prove harmless. Toxic or poisonous substances, as salt brine, washing powders, dish water, etc., that are frequently found in the swill, may cause it.

Symptoms.—The animal shows evidence of severe abdominal pain. The back is arched, ears droop and the abdomen is tucked up. When the abdomen is pressed on, it will cause the hog to flinch with pain. Pain is manifested by grunting, squealing, restlessness, champing and grinding of the teeth. The body temperature is elevated. If the offending matter is fermentive or obstructive, there is bloating. When the stomach is involved, vomiting is a prominent symptom. The inflammation at first causes an intense thirst, and the bowels are constipated. Later a diarrhea is present. The hog becomes very dull and weak, and is generally seen lying down in a bed that it has rooted for itself in the litter. There is no rule as to the duration of the disease. It may last but a short time or continue for a week or more.

Lesions.—The post mortem appearance is a congested and inflamed condition of the mucous membrane lining the intestines, sometimes involving the deeper layers of the wall and the peritoneum; the contents are mucous and flakey in character. The lymphatic glands are reddened and thickened, and if the inflammatory changes are due to a slow infection there may be small pouch like (follicular) ulcers in the mucous membrane.

Treatment.—The hog should be kept in clean quarters. If vomiting has not occurred, the offensive material should be gotten rid of by giving an emetic of ipecacuan (twenty or thirty grains in a little warm water). This can be followed by a laxative of castor oil, one or two ounces, or calomel in from ten to thirty grain doses can be given. To relieve the pain a teaspoonful of laudanum in about the same amount of linseed oil can be given. Rectal injections of soapsuds may be necessary to relieve the constipation. If diarrhea is a symptom of the disease, nitrate of bismuth in dram or half dram doses can be given two or three times a day. As a counter-irritant, oil of turpentine may be applied to the walls of the abdomen and covered up until the skin is quite red. The best diet is well boiled, thin gruels. This should be fed until the hog is able to digest the ordinary rations.—(Ind. B. 100.)

Scours.—When young nursing pigs begin to scour, it is evident that the milk of the sow is disagreeing with them, and immediate attention therefore should be directed towards improving her rations. Most often the trouble comes from overfeeding on corn, or other rich food, just after farrowing, and pigs of fat, flabby, pampered, cross, nervous, constipated sows are most apt to suffer. Sudden changes of food, or feeding sour or decomposed slop, or food from dirty troughs or sour swill barrels, also tend to cause diarrhea either in nursing pigs or those that have been weaned, and all such causes should be prevented or removed.

To correct scouring in nursing pigs, give the sow 15 to 20 grains sulphate of iron (copperas) in her slop night and morning, and if necessary slightly increase the doses until effective. Lime water may with advantage be freely mixed with the slop as a preventive when there is a tendency to derangement, or after the trouble has been checked, and also is an excellent corrective for weaned pigs showing a tendency to scour on slop or skimmed milk.

When little pigs are scouring severely, each may with advantage be given a raw egg and 5 to 10 grains of subnitrate of bismuth twice daily in addition to changing the food of the sow and adding copperas to her slop. In cases which do not promptly respond to treatment success may follow the administration of a dose of castor oil shaken up in milk. In all cases it is important to set right all errors in diet and sanitation and to provide the pigs with dry, sunny, well ventilated quarters. The derangement is always most apt to occur and sure to prove disastrous among pigs kept in unsanitary conditions.—(Wis. B. 184.)

Causes.—Young pigs kept in damp, dark, dirty pens are more susceptible to this disease than if kept in clean pens and allowed plenty of exercise, pure air and sunshine. Scours is often caused within the first few days after birth by the feverish condition of the mother affecting the character of the milk. Fermented foods, slops, moldy corn, etc., when fed to the sow will also cause her to give toxic milk. Chilly, damp weather, getting out in the wet grass when young, and artificial feeding are most frequent causes. Some outbreaks seem to be due to a germ.

Symptoms.—These often appear so soon after birth as to make the pig appear to be born with the affection. When delayed until the pig is a few days or a few weeks old, the scours are generally preceded by constipation. The symptoms of the trouble are loose evacuations, grayish in color, which become more and more watery as the disease progresses. The young animal may show some evidence of abdominal pain. The tail and hindparts soon become soiled with the discharges. The appetite may be good at the beginning, but is gradually lost and the pig becomes dull and weak. The back is arched, hair rough, and there is an indisposition to move about. When the symptoms set in soon after birth, the disease is more apt to prove fatal than if the pigs are several weeks old.

Treatment.—Scours being a disease due largely to bad dietics and hygiene, the preventive treatment is of more importance than the medicinal. This consists in correcting errors in feeding and care. At the time of farrowing the sow should be fed a light, easily digested ration, the pen kept clean and dry and the pigs allowed plenty of exercise and pure air. If the scours are due to a feverish condition of the mother or to irritating food, she should be given two or three ounces of castor oil. To check the scours in the pigs, a few drops of laudanum can be placed on the tongue, or a large dose (from one-half to one tablespoonful) administered to the sow. This should be repeated if necessary.—(Ind. B. 100.)

DIARRHEA, SCOURS, DYSENTERY.

Causes.—Sudden changes in the feed, especially to green feed will frequently cause it. Diarrhea may occur as a symptom in inflammatory diseases of the digestive tract.

Symptoms.—Diarrhea in hogs is characterized by frequent and rather fluid evacuations.

Treatment.—When scours occurs as a symptom of disease, the cause must be removed before we can hope to treat it successfully. In all cases it is best to give a cathartic; castor oil (one to three ounces) or calomel (one to ten grains.) This should be followed by laudanum (half a tablespoonful), prepared chalk (one-half to one tablespoonful) or nitrate of bismuth (one teaspoonful). When any one of these drugs is used, the dose should be repeated as often as necessary.—(Ind. B. 100.)

CONSTIPATION.

Inactivity of the bowels most often gives trouble in pregnant sows and other adult hogs when given too little exercise and too much rich food. In such animals the liver is torpid, the system feverish and the muscles and other organs overloaded with fat. A brood sow in such a condition, and troubled with constipation, will be likely to have weak, puny, or dead pigs, or require help with instruments at farrowing time. Constipation seldom troubles where hogs are fed laxative foods, such as bran, flax seed meal, roots or alfalfa, during the winter season, and in addition are made to take abundant outdoor exercise. Such foods and exercise are most necessary for pregnant sows and usually will obviate the need of medicines. Where such simple means fail, recourse may be had to laxatives. The simplest treatment is to mix two to four ounces of raw linseed oil once daily in the slop for an adult sow, or hog, or where more active treatment seems necessary, give four ounces of Epsom salts at one dose in the same way.—(Wis. B. 184.)

Causes.—Constipation is caused by dry feed, lack of water, fever, paralysis, or it may occur as a symptom of inflammation of the intestines.

Symptoms.—This is the opposite condition from diarrhea.

Treatment.—This consists in giving a cathartic of castor or linseed oil. Epsom salts may also be given. The action of the cathartic can be resisted by an enema. Sloppy food should be fed. —(Ind. B. 100.)

PERITONITIS.

Causes.—Hogs are not as subject to peritonitis as most other domestic animals. It results from the extension of the inflammation from the intestines or other internal organs. Injuries to the walls of the abdomen, exposure to cold, and such operations as spaying and castrating may cause it.

Symptoms.—These resemble those seen in inflammation of the bowels. The history of the case may help us in the diagnosis. The hog is feverish and dull, the back is arched, abdominal walls rigid and the breathing short and quickened. There are indications of abdominal pain.

Treatment.—The treatment is mainly preventive. Such operations as castration, spaying, etc., should be performed under antiseptic precautions. Wounds involving the abdomen are serious and should be carefully treated. Medicinal treatment is of little use.—(Ind. B. 100.)

YELLOWS, JAUNDICE.

This is not a disease in itself but rather a symptom of disease, and is frequently associated with the following diseases: gall stones, parasitic diseases of the liver, inflammation of the intestines and bile duct, and congestion and inflammation of the liver. It is difficult to diagnose liver diseases in the hog, and quite impossible to differentiate one from another. For this reason it is best to discuss all liver diseases under the one head, jaundice.

Causes.—Gall stones are occasionally found in the hog and resemble fine sand in appearance. They may, however, occur as small calculi. The causes of gall stones are concentration of the bile, its becoming infected by bacteria, lack of exercise and over feeding. Liver flukes and round worms may obstruct the bile duct as they pass up from the intestines. The former parasite is rare in this country and is seldom the cause of liver diseases in hogs. The round worms are sometimes found in the gall duct. Inflammation of the bile duct may occur as a complication of indigestion or a catarrhal inflammation of the intestines. The main causes, however, are overfeeding, lack of exercise and decomposed food. Inflammation of the liver is frequently met with in infectious diseases. It may occur as a complication of indigestion. Certain micro-organisms entering the digestive tract with the food and finding their way to the liver may cause it to become inflamed.

Symptoms.—Any condition raising the pressure in the bile ducts or lowering the pressure in the blood vessels of the liver will cause the bile to be taken up by the circulation and carried to the different tissues of the body, staining them a yellow color. This is quite noticeable in the areolar tissue beneath the skin and in the fat, a condition sometimes met with in apparently healthy hogs killed in the abattoir. A staining of the visible mucous membranes and the skin cannot well be observed in the hog. Sometimes the coloring matter of the bile is present in the urine and the normal function of the kidneys is disturbed. Constipation usually occurs and the feces have a more disagreeable odor than normal. When occurring as a complication of other diseases, the liver symptoms are usually overshadowed by the original disease.

Treatment.—The treatment is about the same as in indigestion. As a cathartic, calomel can be administered in from one to ten grain doses and repeated every other day for a few days.—(Ind. B. 100.)

CONGESTION OF THE KIDNEYS.

Causes.—Congestion of the kidneys as a result of injury is not uncommon in hogs. Blows and kicks in the region of the back, or injuries occurring as a result of their piling up on each other, are among the common causes. Exposure, and wet, cold quarters, as in other domestic animals, may also cause it. It may occur as a complication of some infectious disease.

Symptoms.—The pig shows a disposition to lie down most of the time. The hind parts are moved stiffly and the gait is stiff and straddling. Urine is passed frequently and in small quantities. It is higher colored than normal and may be tinged with blood. If due to an injury, these symptoms appear soon after it has occurred.

Treatment.—Preventive measures consist in avoiding as much as possible conditions that may cause the disease. The hog should be given dry, comfortable quarters and fed on slops. A cathartic should be given at the start—one to four ounces of castor oil. Hot water fomentations may be applied to the back and loins.—(Ind. B. 100.)

INFLAMMATION OF THE KIDNEYS.

Causes.—These are very much the same as in congestion of the kidneys. Irritating foods, such drugs as turpentine given internally and applied locally, and pathogenic germs conveyed to the kidneys by the circulation, or entering the kidneys by way of their excretory apparatus are frequent causes.

Symptoms.—The back of the hog may be quite sensitive to pressure. When it stands, the back is arched and held stiffly. The temperature may be elevated, the respiration and pulse beats quickened, and the urine is scant and highly colored. Convulsions may occur. Chronic inflammation of the kidneys may develop very slowly without giving rise to any noticeable symptoms until the disease reaches the later stages. Large abscesses are occasionally found in the kidneys of hogs apparently in perfect health when killed.

Treatment.—The preventive and medicinal treatment is much the same as in congestion of the kidneys. To insure free action of the bowels small doses of castor oil (from two to four tablespoonfuls) should be administered frequently. Diuretics should also be given.—(Ind. B. 100.)

DISEASES OF THE BLADDER.

Retention of the urine and inflammation of the bladder (cystitis) is sometimes met with in the hog. The retention of the urine may be due to spasms of the neck of the bladder, a cystic or urethral calculus, or from a tumor pressing on the urethra and preventing the flow of the urine from the bladder.

Treatment.—The treatment in both diseases is to remove the cause if possible. Inflammation of the bladder is due to retention of the urine and irritation from the bacteria. To relieve the irritation, chlorate of potassium in from fifteen to thirty grain doses can be given twice daily. Pressure on the urethra by the tumor can be relieved by an operation in some cases. Keep the animal quiet and feed mostly sloppy food.

INFLAMMATION OF UTERUS AND VAGINA.

Causes.—Inflammation of the uterus and vagina may be caused by injuries to the walls of the maternal passages and infection from pathogenic germs, or as a result of the retention of dead fœtuses. This latter cause is not at all uncommon.

Symptoms.—These are tumefaction of valva, heat and redness of the mucous membrane lining the vagina, fever, straining, loss of appetite and dullness. In serious cases the temperature is high, the respirations quickened, and the animal shows evidence of severe pain. The inflammation may extend from the womb to the lining membrane of the abdomen. There may be a foul smelling discharge from the vagina. When the inflammation becomes chronic, as it often does, the appetite improves but the sow becomes very thin and weak, and the disagreeable discharge continues. The sow usually dies or is unprofitable to keep.

Treatment.—Preventive treatment consists in being careful in manipulating the passages when aiding in parturition, and in preventing the infection of the parts by the proper use of antiseptics. The genital canal should be washed out twice daily with a two per cent solution of creolin. A gallon or more of warm water should be used, and it is best to give the douche with a fountain syringe. A cathartic can be given if necessary. Quinine and salicylate of soda, 20 grains of each, and gentian 10 grains, should be given every four hours. This should be kept up until the fever has subsided and the appetite returned. Nothing but slops should be fed. Tonics, good feed, and good care are very necessary in the chronic form of the disease.—(Ind. B. 100.)

INFLAMMATION OF THE TESTICLES.

Causes.—Inflammation of the testicles in hogs is usually due to external violence, such as blows, kicks, bites from other animals, wounds, etc. It may occur as a complication with some other disease.

Symptoms.—The first symptom noticed is a painful swelling of the testicles which may extend to the surrounding parts. The rapidity with which the swelling develops will depend on the acuteness of the inflammation. Sometimes the animal has a fever and abscesses may form.

Treatment.—A cathartic of castor oil should be given. Cold or hot water fomentations may be used to keep down the inflammation. Iodide of potassium can be given in the feed three times daily. If an abscess forms, it should be opened and washed out once daily with an antiseptic wash. In some cases it is necessary to castrate the animal. This operation must not be postponed too long.—(Ind. B. 100.)

WATER IN THE SCROTUM.

Causes.—This condition is due to injuries to the testicles and scrotum, the collection of fluid forming as a result of the inflammation of the covering of the testicles.

Symptoms.—Owing to the large quantity of fluid (serum or blood) that may collect between the layers of the tunic, this condition may resemble a scrotal hernia. The swelling is soft, elastic, painless, and confined mostly to the lower part of the scrotum. The fluctuation can be felt on manipulating the swelling.

Treatment.—This is usually unnecessary, as it does not interfere with the health of the animal or endanger its life. The fluid can be drawn off with an aspirating syringe and tincture of iodine afterwards injected into the part. This operation must be performed under aseptic conditions, and should not be attempted by the stockman. The fluid can be removed by castration.—(Ind. B. 100.)

INFLAMMATION OF THE PREPUCE.

Causes.—This disease is seen in barrows, and is caused by the secretions from the lining membrane of the prepuce and dirt accumulating in the prepuce or its folds. If infected by germs, pus will form and the parts become badly inflamed.

Symptoms.—The prepuce becomes swollen, painful, and hot, and there is some difficulty in urinating. Pressure upon the part causes the animal severe pain and a disagreeable smelling material may escape. The contents are usually of a cheesy character.

Treatment.—Before treating the animal, place it on its back, and hold it as quiet as possible. The outside of the prepuce should be fomented with warm water, and the inside of the pouch washed with a two per cent water solution of creolin. If this is not effective, an incision should be made in both sides of the pouch. All the material must be removed and the part thoroughly washed.—(Ind. B. 100.)

COLD IN THE HEAD.

Causes.—Exposure to cold, especially if in an overheated condition or when the body is wet by rain, is the most common cause of catarrh. Hogs overcrowded in pens or allowed to sleep around straw stacks or manure heaps are apt to suffer as a result of overheating and becoming chilled, or by irritation from the dust and noxious gases generated under such conditions. This is especially true during the cold, wet weather when they pile up to keep warm.

Symptoms.—The hog may act dull, the body temperature may be elevated, and the eyes appear red and watery. The nasal mucous membrane becomes red and dry and the hog sneezes frequently. This dry stage lasts for a short time and is followed by a watery discharge from both nostrils, and in the more severe cases this is succeeded by a thick whitish or yellowish discharge. If this continues for some time the mucous membrane becomes markedly changed and ulcers form. Severe outbreaks are known as malignant catarrh. Nasal catarrh does not run a well defined course and may extend to other parts of the respiratory track.

Treatment.—In the simple form of the disease medicinal treatment is not necessary. The hog should be fed warmed slop for a few days and a laxative (castor oil) administered. In severe cases in addition to this, inhalations of medicated steam (turpentine or creolin) may be given.—(Ind. B. 100.)

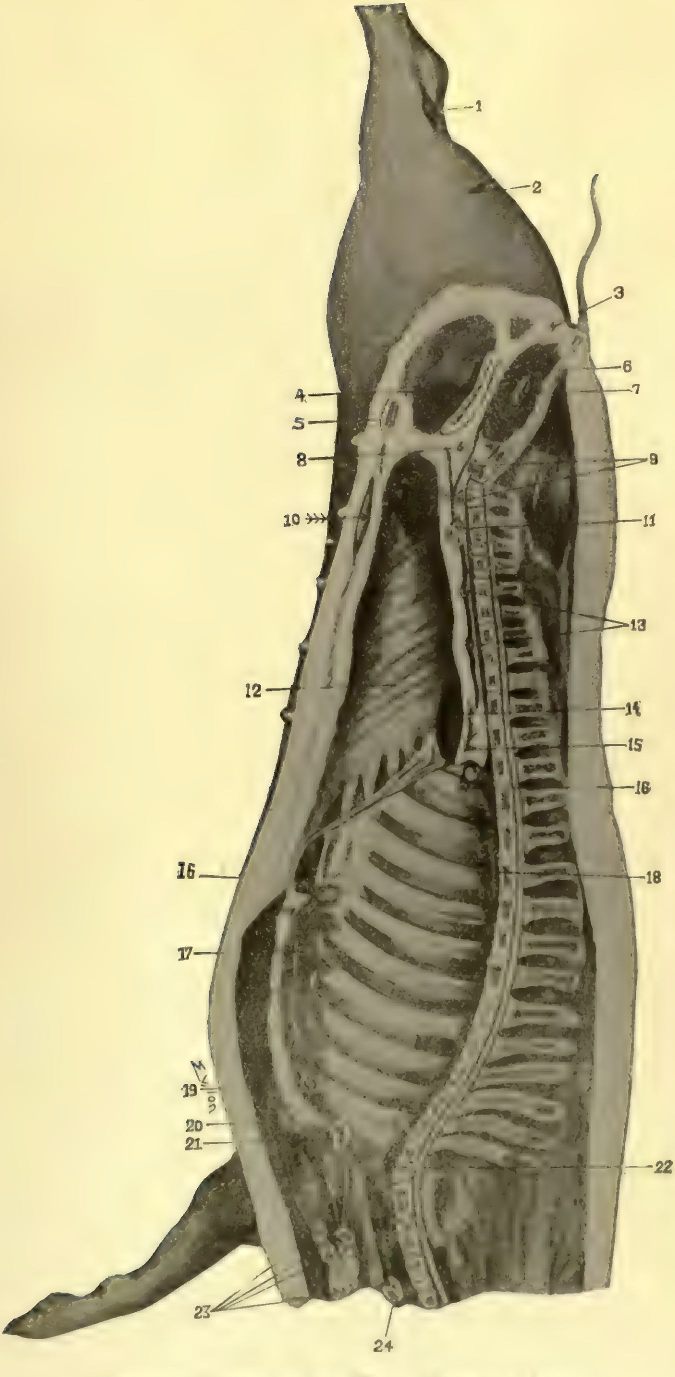
SORE THROAT.

The causes and symptoms of inflammation of the pharynx and larynx in the hog are very much the same. This is also true of tonsilitis, and usually, all of these structures are involved at the same time, and can be discussed conveniently under the one head, sore throat.

Causes.—Sore throat frequently occurs as a complication of a bad cold. In addition to those already mentioned as causes of cold in the head are wallowing in cold springs and creeks when warm, being deprived of water and slops during a warm, dry season, close filthy pens, debility, entrance of septic germs along with the food and germs of hog cholera and swine plague.

Symptoms.—There is more or less fever, the eyes are red and watery and the animal is dull and may lie around the pen most of the time with its head buried in the litter. The appetite is poor and the hog may refuse food, because of the pain and difficulty in swallowing. Sometimes there is considerable restlessness. The respirations are noisy and the throat swollen. The cough may be dry, hard or spasmodic in character, often quite hoarse. There may be a discharge from the nose or mouth. In septic poisoning in the food and in infectious diseases, false membranes may form or the mucous membrane become gangrenous. The disease may develop rapidly and the air passages become closed by the swelling in a few hours and the pig die. Sometimes the animal dies as a result of the local ulceration or from general infection. In the less severe cases the disease runs a course of a week or more. In this latter form, if not caused by pathogenic organisms, recovery usually occurs.

Treatment.—The sick hog should be isolated from the healthy ones and given clean, dry, comfortable quarters. This part of the treatment is very important if the inflammation is due to septic organisms. Sloppy food should be fed and in cold weather it is best to feed it warm. Mild stimulating liniments can be applied to the throat. Sometimes a blistering ointment (powdered cantharides one part and vaseline eight parts) is applied to the skin in the region of the throat. An electuaria is made of syrup three ounces and tincture of aconite (two drams), can be given in teaspoonful or tablespoonful doses thrice daily. By confining the hog with a noose around the upper jaw the throat can be swabbed out with antiseptic washes (silver nitrate one part, water one hundred parts), or permanganate or potassium (two parts, water ninety-eight parts). It is best to make the handle of the swab of wire or the hog may bite



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it in two. In acute attacks, or when the inflamed parts become gangrenous, treatment is of no use.

CHRONIC PNEUMONIA, OR COUGHING.

During the past year a number of cases of cough or chronic pneumonia among swine have been reported from different parts of the State. The disease has also been studied in the vicinity of the Station. While this disease is most frequently reported as attacking pigs or shoats, it also attacks older animals but to a less extent. Chronic pneumonia usually makes its appearance during a dry period, when there is considerable dust. The dust in pens or sleeping quarters seems to be particularly bad, probably because it contains the germs of infection. This dust irritates the lungs, causing the pigs to cough—a deep, moist cough. While the pig does not seem to be seriously sick, it falls away in flesh, becomes unthrifty, and in some cases death follows. As the disease progresses the coughing becomes more pronounced and there is labored breathing, particularly when the animal is exercised. Examination after death reveals a chronic inflammation of the lungs. The affected portions of the lung are solidified and often contain small pockets filled with pus. In a few cases cavities of considerable size are found filled with thick, cheesy pus.

Treatment.—As soon as a case of coughing occurs among swine, the healthy pigs that show no signs of the disease should be removed from the ailing pigs and placed in clean, uninfected quarters. The infected quarters should be cleaned thoroughly, and all bedding and other litter removed and burned. The floor, walls and all parts of the infected quarters should be thoroughly saturated with five per cent solution of carbolic acid or creolin in water. This should be repeated in a week. The ailing pigs should be bedded with forest leaves or some other material free from dust. Swine suffering from chronic cough should be well fed with a variety of easily digested, nutritious food and should be given some tonic condition powder. That recommended by the United States Department of Agriculture is excellent. In case hog houses or yards become infected with the germs of chronic pneumonia, sows about to farrow should be removed to clean, uninfected quarters, and the young pigs should not be allowed in infected quarters until they are pretty well grown, when the danger of contracting the disease is slight.—(Va. B. 189.)

BRONCHITIS.

Causes.—These are the same as in common cold or sore throat. Bronchitis is frequently caused by irritation from dust or parasites.

Symptoms.—In the acute form the body temperature is elevated and the appetite impaired. The breathing is usually distressed and coughing frequently occurs. The disease does not run a definite course and may become chronic if the exciting causes are kept up. When this occurs, the pig does not thrive as it should and if the air passages are irritated in the least by dust, etc., it will cough violently. Coughing is especially prone to occur upon leaving the bed or after exercise. Pigs seldom die of this affection. *Treatment.*—This is largely preventive. Good food and care are about all the treatment necessary.—(Ind. B. 100.)

PNEUMONIA.

Causes.—It is not uncommon for the inflammation to extend from the air passages to the lungs and the animal have a serious attack of pneumonia. Plethora is the principal predisposing factor. Among the exciting causes can be mentioned fatigue and impure air. In young hogs the lung worm will frequently cause a lobular pneumonia.

Symptoms.—Pneumonia may come on quickly, beginning with a chill and attended with a high fever, or as a complication of some other respiratory disease. The hog will remain down most of the time, hiding under the litter and will eat nothing or but very little. The respirations are hurried. Exercise is followed by marked exhaustion, sometimes by death. The cough is at first deep and dry, later more moist. During the first stage of the inflammation, the period of congestion, the cough may be accompanied by hemorrhage. Other symptoms will be revealed in thin, quiet hogs by placing the ear to the side of the chest and listening to the lung sounds (auscultation). In the very earliest stage of pneumonia a crepitating sound may be heard in the diseased area, later when the engorgement of the air cells occurs, the healthy murmurs and the crepitating sounds are deadened. When the lung tissue is returning to the normal state, the crepitating sounds can again be heard. The disease may involve one lung or part of both. The chances for recovery are better in lean than in fat hogs, as the disease is usually less severe. The attack runs a course of from ten days to two or three weeks.

Treatment.—The hog should be given a comfortable pen and kept as quiet as possible. If it will eat, a light sloppy diet should be fed. To keep the bowels loose, from one to three ounces of castor oil can be administered occasionally. As a counter-irritant to the sides of the chest the following liniment can be used; oil of turpentine ten parts, croton oil one part. If the heart action is weak, from five to ten drops of tincture of digitalis should be given every three or four hours. During the convalescent stage, if the animal appears weak, alcoholic stimulants can be given.—(Ind. B. 100.)

PLEURISY.

This is an inflammation of the membrane lining the chest cavity and covering the lungs. *Causes.*—Pleurisy may develop during the course of pneumonia. Sudden chilling of the body, especially if overheated, exposure to cold and damp pens are common causes. It may occur in the different contagious diseases (hog cholera, swine plague, and tuberculosis).

Symptoms.—The early symptom of the disease is chilling. Sometimes the hog is lame in one or the other of the fore legs and appears stiff when it walks. The appetite is poor and the hog is restless or lies down most of the time. The breathing is highly characteristic. The ribs are held rigid and the respirations are short and jerky, the movement being noticed mostly in the flank. The body temperature is higher than normal, the pulse quickened and the cough rather suppressed. Pain is a very prominent symptom. When the sides of the chest are pressed upon with the hand the hog will flinch, sometimes grunt or squeal. On auscultation friction sounds are heard. In case there is an outpouring of fluid into the chest cavity (hydrothorax) these sounds are not heard and all respiratory sounds toward the lower part of the chest are deadened. If much fluid accumulates in the chest cavity, the symptoms of pain are diminished, but the respirations are more labored and the pulse weaker. Toward the later stage of the disease, the hog is greatly depressed. When made to get up, it may squeal. Frequently, it is seen lying on its side as though it were dead. The course of the disease is from one to two weeks. In mild cases and when only a part of the pleura is involved the symptoms are less severe.

Treatment.—Good care at the beginning of the attack will help in aborting it. The hog should be placed in a warm, clean pen and made as comfortable as possible. In a warm pen and when the hog is quiet, warm packs can be applied to the sides of the chest and the hog covered with a blanket. The medicinal treatment does not differ greatly from that recommended in pneumonia. A teaspoonful of syrup of squills and from three to six drops of tincture of aconite can be given three times daily. Sulphate of quinine, five to twenty grains, and nitrate of potassium, ten or fifteen grains, can be given every four hours. The same blistering liniment as recommended in pneumonia can be applied to the walls of the chest. It is best to administer a physic early in the attack, and feed the hog a light sloppy diet.—(Ind. B. 100.)

FATTY DEGENERATION OF THE HEART.

Causes.—Fatty degeneration of the heart is due to overfeeding and lack of exercise. The flat accumulates in masses around the heart and in the muscular tissues, the natural structure being replaced by fatty granules.

Symptoms.—In this disease, the heart action is weak and irregular. The hog is unfit for any kind of exertion and may die suddenly if this is attempted. Palpitation may occur. Treatment is preventive, and consists of avoiding such conditions as would cause disease.—(Ind. B. 100.)

THUMPS.

This term is applied to that ailment of young pigs which is indicated by spasmodic jerking motions of the flanks. These are at times so severe that they move the body backward and forward. The trouble is akin to hiccoughs and the contractions of the diaphragm may, in some cases, be associated with palpitation of the heart. In thumps there usually is derangement of the digestive organs, as well as of the nerves and overfeeding and lack of exercise would seem to be the common cause. The tendency of this disease apparently is hereditary, pigs of pampered sows being most prone to such attacks.

Prevalence of the trouble in a herd of hogs indicates the advisability of infusing fresh blood by the use of vigorous boars and choosing young and robust sows for breeding purposes. Careful feeding and abundant enforced exercise will then prevent the occurrence of thumps, which may be set down as the results of bad management. It seldom pays to treat badly affected pigs. Prevention is of far greater importance than treatment, but the latter should consist in giving the affected pig a dose of castor oil and following with teaspoonful doses of paregoric, or 5 to 15 drop doses of laudanum two or three times a day to allay distress. Then feed on light, easily digested food, and have the pig live an outdoor life.—(Wis. B. 184.)

PALPITATION, SPASM OF THE DIAPHRAGM, THUMPS.

True palpitation is a sudden violent beating of the heart not connected with any structural disease of the organ. It sets in suddenly, the cardiac sounds are louder than normal, the beats are quickened and the animal may be restless and appear anxious. This affection sometimes occurs during the course of some digestive disorder. Excitement and exercise may also cause it. Spasm of the diaphragm is quite common in pigs. Digestive disorders, especially overloading of the stomach and lack of exercise, are the main causes. A number of pigs in the litter or in the same pen may become affected at the same time. This is especially true of litters not given sufficient exercise.

Symptoms.—There is a sudden jerking movement of the flank. When the pig is standing quietly, this is very noticeable, and may be of such violence as to move the body backwards and forwards. It may be accompanied by a sound that can be heard some distance. These contractions are not rhythmical, but occur more frequently at one time than at another. After exercise the jerking is violent, and after a full meal, is more pronounced than when the stomach is empty. Thumps interfere with the pig's appetite to a certain extent and they do not thrive, becoming stunted in some cases. Sometimes they lose flesh quite rapidly and become very thin. The course of the disease is from a few days to several weeks.

Treatment.—Exercise alone will generally effect a cure. When the disease develops in a litter, they should be turned on pasture and given plenty of opportunity to run around. If this cannot be done they must be given exercise in some other way, as placing them in a pen or box away from the mother. From three to fifteen drops of tincture of opium can be administered in a little oil every three or four hours to give relief. It is well to administer a physic of raw linseed oil at the beginning of the trouble.—(Ind. B. 100.)

CONGESTION OF THE BRAIN.

Causes.—In congestion, the blood vessels of the brain become engorged with blood. Fat, plethoric hogs are predisposed to this condition. The exciting causes are sunstroke, exertion, tumors and parasites pressing on the brain, and blows on the head. Congestion may occur as a complication in some of the infectious diseases. Anemia of the brain is due to an insufficient amount of blood in the brain, and may be caused by a weakness in the heart action or severe hemorrhage.

Symptoms.—These generally come on very suddenly. The hog shows symptoms of excitement and sensitiveness, or appears dull and drowsy. Death may occur in a short time. Apoplexy due to rupture of capillaries in the brain sometimes occurs, and the disease tends to merge into an inflammation of the brain.

Treatment.—Place the hog in a cool place and apply water or ice to the head. Bleeding at the beginning may be followed by good results. As a purgative, four or five ounces of linseed or castor oil can be given. The after treatment consists in keeping the hog quiet and in a cool comfortable place. In anemia of the brain, the medicinal treatment is along the line of stimulants, and cold applications to the head are contra-indicated.—(Ind. B. 100.)

INFLAMMATION OF THE BRAIN.

Causes.—As causes of this disease can be mentioned high temperature as in summer, unusual exercise, sudden changes in the feed, overfeeding, parasites (cysticercus), unsanitary conditions and injuries to the head. Inflammation of the brain occurs in some infectious diseases. It may follow a congestion of the brain.

Symptoms.—They usually set in abruptly, the hog apparently in perfect health will within a few hours manifest serious symptoms of a nervous character. The disease is usually ushered in by a period of dullness. In some cases, however, the hog appears nervous and excited from the first. During the period of excitement or delirium, the hog champs its teeth, froths at the mouth, walks or runs about the pen, generally in a circle and without showing much ability to dodge obstructions. It will squeal or grunt, try to climb up on the sides of the pen, press its head against the wall or fence, and finally fall over in a convulsion. It may regain its feet in a short time or lie in a stupor which usually ends in death. The gravity of the disease cannot always be judged by the frequency and violence of the attacks, as often when the hog is sleepy and drowsy from the first, it rapidly proves fatal. The course is usually short and the prognosis unfavorable.

Treatment.—A large dose of salts should be given early in the attack. Bleeding and cold applications to the head prove of some value by lessening blood pressure in the brain. The pen should be dark and cool. When the disease terminates in paralysis, iodide of potassium, twenty grains, and tincture of nux vomica, ten or twenty drops, can be given in a few ounces of water three times a day.—(Ind. B. 100.)

APOPLEXY.

Apoplexy may occur in hogs that are in a very fat condition and is due to a rupture of a bloodvessel in the brain. It sometimes happens as a result of congestion of the brain. When this accident occurs, the hog drops suddenly, becomes unconscious and is usually dead in a short time.—(Ind. B. 100.)

BLIND STAGGERS.

Vertigo may be associated with diseases of the brain and its membranes, such as anemia, congestion, tumors and parasites (cysticercus), especially the latter.

Symptoms.—These are attacks of blindness, jerking upward with the head, turning in a circle or rotating on the long axis of the body, running straight ahead and finally falling on the side or rolling over and over. When due to parasites, the hog turns to the side on which the parasite lies and the attacks are apt to occur at any time.—(Ind. B. 100.)

SPASMS, FITS.

This disease is characterized by sudden loss of consciousness, convulsive movements, etc. In the intervals between the attacks the hog may appear in good health.

Causes.—Epilepsy may be due to lesions in the spinal cord or brain. It is sometimes transmitted from the parent to the offspring and in-breeding is also thought to cause it. Intestinal worms are probably the most common cause of spasms in young pigs. It may also occur as a result of dentition.

Symptoms.—The pig may be restless previous to the attack. The convulsive contractions generally begin in the muscles of the head and extremities. Jerking of the muscles of the face, champing of the jaws and an unsteady gait is noticed at first. Suddenly the pig falls, consciousness is lost, the limbs are extended and the seat of convulsive movements, the head, may be thrown back, saliva runs from the mouth and urine is passed. Because of the respiratory muscles being involved, the animal has great difficulty in breathing. In mild cases the convulsive movements are feeble and may cease in a few seconds. Usually the attack lasts a few minutes. The hog may get up and act as though nothing had happened or act dull and sick for several days. There is some danger of the pig dying in an attack. Sometimes during a seizure, the other hogs in the pen will kill it.

Treatment.—The spasm may be stopped by throwing cold water on the pig's head, or better by immersing its body in warm water. The pig should be kept as quiet as possible between attacks. A cathartic of castor oil should be given. Until the stupor has completely passed, it is best to give from half a dram to a dram of bromide of potassium in the feed or drench twice daily. As soon as it acts well, it can be turned out with the rest of the herd.—(Ind. B. 100.)

CHOREA.

This affection is commonly seen in young pigs, but may develop at any age. The causes of the disease are not definitely known. It is more commonly seen in weak, poorly developed or deformed pigs, especially those having a bulging forehead and showing a tendency toward hydrocephalus.

Symptoms.—Chorea is characterized by spasmodic movements of some part of the body, as the head, or one or more legs. The head is most often affected, and is jerked to one side and may be accompanied by wry neck. The jerking occurs in quick succession, or there may be considerable interval between jerks. The attacks may become spasmodic, that is, very bad part of the time and only slightly so at other times. The jerking takes place more or less constantly during the waking hours. If a leg be affected, it will be drawn up and put down suddenly, keeping up the motion more or less constantly while standing. There will also be some twitching when lying down and not asleep. Often when pigs are so affected, although in good condition when the trouble begins, they become thin and puny.

Treatment.—The best treatment is to turn the affected pig out on clover pasture and give it plenty of milk. As the animal grows, it may gradually get better without medicinal treatment. Good results may follow the administration of tincture of asefoetida in half tablespoonful doses two or three times a day.—(Ind. B. 100.)

SUNSTROKE OR HEATSTROKE.

Hogs, especially fat hogs, when driven on a very hot day, or handled and shipped some distance are apt to be overcome with the heat. If kept in a pasture unprovided with shade, they may suffer severely from the sun.

Symptoms.—The principal symptoms are fatigue, dropping of the ears, staggering gait, sudden collapse and unconsciousness and death. Convulsions may occur and death generally follows in a short time.

Treatment.—The preventive treatment consists in not handling fat hogs during the hottest part of the day in the very warm weather, and providing the hog pasture with some shade. When handling hogs in hot weather, frequent wetting with cold water will help in keeping them cool. If overcome by the heat, it is best to move the hog to a shady place and pour cold water on the head, but not upon the body. As a stimulant, alcohol (one tablespoonful) or tincture of nux vomica (one teaspoonful), can be given in a little water. —(Ind. B. 100.)

PARALYSIS.

Frequent reports are received of cases of paralysis of swine. The disease usually attacks the hind quarters (for fuller description see following page), but sometimes affects the whole body. It first appears as a slight loss of control of the hind legs, as shown by a weaving of the body, knuckling at the fetlocks, and finally a paralysis more or less complete. The animal is unable to raise itself on its hind legs and often drags the hind quarters as it moves about. The disease occurs in swine of all ages, from suckling pigs to aged animals, and in various conditions of flesh. This paralysis is not to be confused with a staggering gait that is due to weakness resulting from a lack of proper food. This disease is popularly supposed to be caused by "Kidney Worm" *(Stephanurus dentatus)*, but there is no evidence to support this belief. We have examined herds of swine, all badly infested with "Kidney Worm," with no cases of paralysis; and in those cases of paralysis examined after death, we have failed to find kidney worms in most cases. While kidney worms were present in two or three cases, they did not seem to be the cause of the paralysis. The disease seems to be located in the spinal cord at the lumbar region, but the actual cause is unknown at present.

Treatment.—Some cases recover without treatment, but a majority of the cases prove fatal. The animals remain paralyzed, unable to move or barely able to drag the hind parts around, until humanity prompts their destruction.

Generally the treatment is to give a purgative of from one-half to two ounces of castor oil, depending upon the size of the animal, followed by nourishing, easily digested food. Rubbing the back vigorously with a good veterinary liniment once daily is also beneficial. If the animal is unable to move about, its position should be changed frequently, and from one side to the other.—(Va. B. 189.)

PARALYSIS OF THE POSTERIOR PART OF THE BODY.

Causes.—Small centers of inflammation in the spinal cord due to injuries in the region of the back will cause a paralysis of the hind parts. Pressure on the cord from tumors, parasites (cysticercus), or an overfat condition will also cause it. It is not uncommon for paralysis to occur among a number of hogs in a pen when shipped in cars or in a crate. Lack of exercise, indigestion and constipation are said to cause this condition. This disease is usually called "kidney disease."

Symptoms.—The paralysis may develop suddenly or come on gradually and nearly always involves both hind legs. When the disease develops slowly the first symptom noticed is an unsteady gait, the hind legs do not follow exactly in line with the front ones, become crossed, or instead of walking directly forward, the body appears to go sidewise. After lying down there is more or less difficulty in getting up. These symptoms become progressively worse until the hog simply drags the hind parts. If the paralysis develops suddenly, the pig is found dragging the hind parts and unable to get up on the hind legs. The appetite is usually good in the early stage, and may remain so. Pressure over the affected region does not cause the animal pain, but sometimes it will squeal when moved. The appetite may become poor and the bowels constipated, depending upon the extent of the lesions. If recovery does not take place within a few days or a week, the case is not apt to terminate favorably.

Treatment.—This consists in moving the hog to a comfortable pen where it can not be disturbed and feeding it mostly on sloppy food. It is very necessary that no dry feed be given in order to prevent constipation. Early in the disease a cathartic of Epsom salts should be given and repeated if necessary. This may be supplemented with an enema of water and glycerine. From five to ten drops of tincture of nux vomica should be given two or three times a day. Counter-irritation along the back by means of blistering liniments (oil of turpentine ten parts, croton oil one part), or the firing iron can be used. Dr. Peters, of Nebraska, recommends the firing iron. To fire the back of a hog, number sixteen wire can be used. There should be fifteen or sixteen pieces about a foot in length pointed at one end. The pointed end should be placed in a charcoal or corn cob fire and heated to a white heat. When ready for use, they can be held in a pair of pincers, and the skin punctured at points an inch or two apart in the region of the loins. The wires should be allowed to pass through the skin and into the tissue beneath, or the operation will not give satisfactory results. The hog should not be forced to walk, as this will retard recovery. After the animal is able to walk, keep it away from other pigs for a few weeks. —(Ind. B. 100.)

STERILITY, BARRENNESS.

Sterility may exist in the male or female and may be temporary or permanent. Some years the per cent of barren sows is very large. The cause for the condition has not been ascertained.

Causes.—In the male impotency is sometimes a functional trouble, due to improper development of the sexual organs or a broken copulatory organ. Other causes are a fatty degeneration or infiltration of the testicles, lack of physical or functional exercise and old age. In the female, sterility may result from a greater variety of conditions than in the male. Excessive fattening, as is sometimes seen in sows fitted for exhibition purposes, will cause it. This may be due to the ovaries becoming so infiltrated with fat as to interfere with their function, or to an occlusion of the passages with fat. In the former case the change is often so great that nothing will insure a complete return to the normal, but in the latter the function can be restored by reducing the condition of the sow. Sometimes a rigid os prevents the entrance of the seminal fluid into the womb. Such a condition may occur in young or aged sows. Inflammation of the lining membrane of the uterus or vagina may also cause it. In this condition a discharge, usually so slight as to escape notice, occurs, and when the male element comes in contact with the abnormal secretions, it is destroyed. In old age barrenness occurs. Faulty development of the generative organs is not uncommon in sows. The uterus may be abnormally small, the ovaries rudimentary and the vagina and os imperforate. In these cases, the sow may never come in heat and never conceives.

Treatment.—Excessive fat is a frequent cause of sterility in both the male and the female and must be overcome by dieting and exercise. The male should not be used to excess and should be kept in a healthy, vigorous condition. If the os is rigid and closed, preventing the entrance of the seminal fluid into the womb, it should be dilated. Closure of the maternal passages by fat can be overcome by a proper diet and plenty of exercise.—(Ind. B. 100.)

ABORTION.

Abortion or slipping of pigs is a troublesome problem with which to deal. There seems to be two varieties in these animals, the same as in the other domestic animals, sporadic and infectious. The sporadic form is the variety most often met with and is due to accidents, as slipping, falls, being kicked by a horse, or hooked by a cow, by being run by dogs, or worried by other sows in heat, or by a boar, to spoiled or musty food, to "piling up" in bed, to sudden exposure to cold and to the effects of some other disease, as cholera. It can readily be observed that these causes will not as a rule act upon many sows in the same herd with sufficient violence to cause abortion, as the sow does not abort easily. After an outbreak of cholera we expect a considerable percentage of abortion. While an infectious abortion of the sow has not been described, the Station has been the recipient of several accounts of such trouble that could not be accounted for upon any other hypothesis. In these cases a greater or less percentage of the herd would be affected, and, like barrenness, the trouble is much more frequent some seasons than at others.

Symptoms.—The symptoms of abortion when due to accidental causes are great uneasiness, shivering, making of a bed, violent straining and groaning. The parts are unprepared for the accident and therefore is associated with considerable pain and occupies several hours. If the abortion occurs within the first two months a discharge of blood and a macerated foetus and membrane are all that will be found. After two months the foetuses will be entire. In some cases there will be a loss of appetite and an indisposition to move about for a few days, while in others the disturbance is so slight as to be scarcely noticeable. In the infectious form of the disease the genital tract seems to be prepared and there is less disturbance than in normal labor, and unless the swollen genitals and the expelled foetuses are seen, the first warning of such an accident may be the recurrence of heat. Infectious abortion seems to occur most frequently at the end of the second month.

Treatment.—Very little can be done to arrest the act and without knowing the cause it is hard to prevent. It is a wise measure in all cases to remove abortion sows from the herd upon the assumption that it may be infectious and that the presence of such an animal may be a menace to others.—(Ind. B. 100.)

MAMMITIS. GARGET.

Causes.—Inflammation of the udder may occur in heavy milkers, due to the fact that all of the milk is not drawn. This condition may exist when a part or all of the litter dies. Obstructed teats will sometimes cause it. Following a difficult case of parturition the udder will sometimes become inflamed.

Treatment.—Remove as much milk as possible and bathe the udder with hot water for twenty minutes several times a day. Knead the parts thoroughly. As a local application use a dram each of tincture of belladonna and spirits of camphor in two ounces of lard, rub well when applying it. A cathartic of Epsom salts or castor oil should be given every other day until the condition is relieved. When the teats are sore, they should be bathed once a day with white lotion (one part zinc sulphate, three-fourths of a part lead acetate, thirty parts water) until healed.—(Ind. B. 100.)

URTICARIA.

Causes.—Unhygienic conditions and irritation to the skin from lice and drugs are frequent causes of urticaria. Young pigs are predisposed to this class of skin diseases, and it may be seen in the different specific diseases, as cholera and swine plague.

Symptoms.—The blotches come on the skin very suddenly, usually in the night and appear as red, hot, swollen spots that may run together and become very large. The spots are seen on almost any part of the body. On account of the itching, the hog will scratch and rub the part and the surface may become abraded. In the light cases, the trouble will pass off about the second day without the formation of pustules. In the more severe form, pustules develop and it requires a week or more to make a recovery. The appetite is usually impaired and the hog is feverish. This disease is not contagious.

Treatment.—Two or three ounces of Epsom salts should be given in the feed, and the hogs fed a light sloppy diet. If dirty or lousy, they should be dipped or washed with a watery solution of some of the cresol preparations. In severe cases ten drops of Fowler's solution of arsenic should be given twice daily.—(Ind. B. 100.)

ECZEMA, PITCH MANGE.

Causes.—This disease is associated with unhygienic conditions, filthy pens, extremes of heat and cold, and a debilitated condition. It may also occur in specific diseases (hog cholera, articular rheumatism, etc.). What seems to be a variety of this form of mange, occurs upon marsh land in the summer, when dry, due to the irritation of the soil—itch dirt. This is seen frequently in the Kankakee region.

Symptoms.—The disease starts by small red spots on the skin. These are followed by vesicles (blisters) which in time become pustular. Finally these dry up and form thick crusts which gradually wear down and become thin and branny. All stages of the disease may be seen on the skin at the same time. There is intense itching and the hog may have a slight fever, a poor appetite and act dull.

Treatment.—This consists in bettering the hygienic conditions under which the hogs are kept, and either washing or dipping them in a water solution of some of the coal tar preparations. The washing or dipping should be repeated at frequent intervals.—(Ind. B. 100.)

SKIN WARTS.

Warts are simply piled up epidermal cells and are best removed with a knife. A preparation of a dram of salicylic acid in an ounce of castor oil, rubbed on once or twice a day for a couple of weeks may remove them.—(Ind. B. 100.)

SORE TAILS.

Causes.—The causes of sore tails, and tails dropping off, are cold, filth and injuries. When young the tail may become injured by the mother stepping on it. Sometimes when the pen is filthy bacteria will cause it. Old hogs, when allowed to wallow in the mud, may lose a portion of their tails from the mud balls that accumulate toward the ends. Loss of the tail is frequently associated with an unthrifty condition.

Treatment.—This is preventive. If the pens are filthy, they should be cleaned and antiseptics used freely. The loss of the tail is of little consequence to the ordinary hog, but for those used for other purposes or to be sold as breeders, it becomes a blemish.—(Ind. B. 100.)

RHEUMATISM.

Articular and muscular rheumatism are so frequently associated in the hog that it is best to discuss them together. Although hogs live under favorable conditions for the development of rheumatism, they do not often develop the disease. This is probably due to the protection afforded by the subcutaneous fat.

Causes.—This disease is attributed to cold, damp pens and exposure, but it may occur in hogs when well managed. Overfeeding is also said to cause it. Rheumatic symptoms are frequently noticed at the beginning of an outbreak of hog cholera.

Symptoms.—The muscles and joints may both be involved and the symptoms quite marked. There may be a fever, loss of appetite and a general lack of condition. The lameness will move about and may involve one or more of the legs. Sometimes there is considerable swelling of the hock, the knee or the joints of the foot. If the muscles of the back are involved, it is arched and very tender on manipulation. Stiffness in the gait is present, especially if the quarters are involved. The pain in the muscles and swollen, inflamed joints is intense, and the hog will sometimes squeal when the parts are handled or the joints flexed. While the hog is asleep there may be sudden contractions, indicating pain due to relaxation of muscles. On account of the pain and difficulty in walking, the hog will lie around the pen most of the time and refuse to go far for his food.

Treatment.—Preventive treatment is very important. It means the providing of dry, comfortable quarters and the avoidance of exposure. The straw stack should be avoided as a shelter for hogs. Sick hogs should be given sloppy feed. Salicylate of soda can be given in twenty or forty grain doses three times daily. Recovery occurs in from two to three weeks. The disease may become chronic.—(Ind. B. 100.)

RICKETS.

In this common disease of young pigs there is enlargement, bending and distortion of the bones of the joints and limbs, and fractures of leg bones often occur. The bones of the body in affected pigs lack their normal proportion of mineral material and have an excess of vegetable matter. The tendency to disease is hereditary and most likely to be seen in closely inbred hogs or those of herds kept under unsanitary conditions and long imperfectly nourished upon unbalanced rations, and allowed too little exercise upon grass.

The excessive feeding of corn to generation after generation of pampered hogs, doubtless induces a weakness of constitution conducive to rickets and the disease may appear as a result of any aggravating circumstance productive of malnutrition. Worms, indigestion, diarrhœa, constipation, prolonged use of acid food, lack of exercise, exposure, dark, dirty, damp quarters and any other influence detrimental to health may give rise to the ailment. Fattening hogs may suddenly go down paralyzed in their hind parts, or the thigh bones or shoulder blade may break, and the animal be unable to walk. Fat, heavy, nervous sows, after nursing pigs for some time, may become weak, stagger, and finally go down paralyzed. Distortion of the snout ("bullnose") and difficulty of breathing ("snuffles") are often associated with rickets in swine, and prove fatal.

Pigs affected with rickets can seldom be profitably treated. Prevention is to be sought by avoiding the causes mentioned, maintaining sanitary conditions about the hogs, providing adequate supplies of various foods, rich in all the requisites of a perfectly nourished animal, and obviating degeneracy by careful selection of robust sows and timely infusion of fresh blood.—(Wis. B. 184.)

Causes.—This condition is due to a lack of development of the bones. The mineral matter is not deposited in the normal proportion. It is seen in growing pigs after weaning. It most often occurs in those that receive an almost exclusively corn diet with no milk and no pasture. It is seen more often in winter than in summer because the conditions enforce the penning and feeding of pigs at that season. It is also seen in some litters which might indicate that it was hereditary.

Symptoms.—The disease is characterized by weakness of the bones, bending of the legs, breaking down upon the feet; there may be either a dropping or arching of the back, a spraddling gait, distorted face, bulging forehead, sniffles and paralysis. Such pigs are nearly always fat at the beginning. The disease does not tend to destroy the animal quickly, as it is a slowly progressing disease.

Treatment.—The treatment as far as it can be of service, is to feed less fattening food and substitute milk, oats, rye, and a little oil meal. An abundance of salt, charcoal, wood ashes and air slaked lime should be available.—(Ind. B. 100.)

SORE FEET.

Causes.—If hogs are kept continually on hard floors or driven over hard, rough roads, the feet may become inflamed and bruised. Standing in filth may cause the feet to become sore, the moisture softening the tissue at the upper margin of the wall, in the interdigital space and at the heel.

Symptoms.—The hog flinches a great deal when it walks, goes quite lame. This is especially true of heavy hogs, and if the pain is severe, they lie down most of the time. On making a local examination, the claws may be found long and overgrown or the heels and the space between the claws is swollen, sore and inflamed.

Treatment.—When caused by hard floors, simply turning them out on pasture will effect a cure. If the pens and yards are filthy, they should be changed to clean dry pens, and the feet freed from all filth and washed once a day with a four per cent. watery solution of some of the coal tar preparations; or with chloride of zinc (one teaspoonful to the pint of water). It is very necessary that the hogs be kept in a clean, dry place until well.—(Ind. B. 100.)

SNIFFLES, SNUFFLES, BULLNOSE.

It is evident from the descriptions given that all writers are not agreed upon the nature of this affection. There are two varieties of the affection—the catarrhal and the rachitic. In the catarrhal form we have a more or less wheezing, respiration occurring at irregular intervals. There is a profuse, watery discharge from the nostrils, causing the animal to blow violently when first getting out of bed or after eating. The animal can not exercise freely owing to the difficult respiration. The attacks, which are mild and of intermittent character at first, become more severe and the condition is persistent. The discharge changes from a thin, water secretion to one containing blood, to thick mucus, and finally yellowish or purulent. Nose bleeding is frequent owing to the violent efforts to clear the nose. There is a cough, the eyes become red and the tears flow, the hair roughens and the whole appearance is "dumpish." There is difficulty in seizing, grinding and swallowing the food, owing to the soreness of the mouth and throat. The trouble runs a course of from one to five weeks and death comes from starvation or asphyxia. Those that recover nearly always remain stunted. A post-mortem examination of such a case shows the mucous membrane lining the nasal chambers to be greatly thickened, practically blocking the air passages. The turbinates and the septum become so crowded by the uneven pressure that they are deformed. The effect is to produce a blunt, thickened, more or less twisted nose, depending upon the uneven changes in the different bones. In the rachitic form we have essentially the same changes take place in the nose, and in addition there are changes in the bones in other parts of the body. The legs become curved and misshapen, and often there is breaking down on the feet. Not infrequently, too, there will be bulging of the bones of the head, as in hydrocephalus.

Causes.—The cause of the trouble is not definitely known. By some all the cases are regarded as being primarily due to a lack of development of the bones in the nose, thus predisposing to catarrhal trouble. Others consider that the trouble may be catarrhal from the beginning, due to catching cold, and that the changes in the bones are secondary. The writer is of the opinion that some cases belong to one class and some to the other. The disease is sometimes described as being contagious, but we are not in possession of facts to justify such a statement. It is more probable that the conditions which give rise to the trouble in one pig may also affect others. It is frequently observed to affect all the pigs belonging to one litter, but I have never witnessed the trouble pass from the pigs of one litter to pigs of another. It has also been observed in four successive litters from the same mother, thus showing a hereditary tendency. There were also other evidences of rickets present. We find this trouble in pigs kept under good hygienic conditions as well as in those that are subject to exposure and poorly nourished, and it is more common in those breeds with stubby, turned-up noses than of the straight variety.

Treatment.—The best treatment is to destroy such pigs. It will end their misery and save expense. The majority will die and those that recover will not be worth feeding in nine cases out of ten. Those who wish to try to save them should put the pigs upon a good pasture and feed sweet milk. Corn should not be given, or, if it be given, there should be oil meal added to balance the ration. If pasture can not be secured, provide a dry, warm pen. Keep the bowels open as the symptoms may indicate. Fumigate with burning tar and apply tar about the feed troughs. An ointment composed of equal parts turpentine, kerosene and ammonia in sufficient lard to make it stiff has been recommended as an application to the face. This is repeated twice a week for a month.—(Ind. B. 100.)

The name bullnose is applied to a disease of suckling or weanling pigs, characterized by sores in the mouth or upon the lips, caused by a germ *bacillus necrophorus*. This disease is technically called *necrotic stomatitis*.

The first symptom usually observed is a swelling about the nose. Sometimes the swelling is greater on one side than on the other and gives the nose a slightly wry appearance. Generally, however, the swelling is diffused and sometimes interferes with the breathing, producing a wheezing sound. The swelling of the nose gives rise to the common name of this disease, "bullnose."

If the mouth is examined, one or more sores will be found, generally occupying the inside of the lips or gums, often extending to the edges of the lips. In other cases the tongue is diseased. The sore area presents a dark-colored surface, and, if between the lips and gums, often contains considerable food material that emits a very offensive odor. The edges of the wound are swollen and of a purplish color. The sore is very sensitive and usually bleeds profusely when injured slightly. As the disease progresses, the sore not only extends its area but also becomes deeper. The lips become thick from congestion and the roots of the teeth are often exposed as a result of the ulceration. The pig is unable to eat properly, falls away in flesh, and, in severe cases, often dies.

As soon as a case of sore mouth, or "bull nose," is observed, the litter or bunch of young pigs that are running together should be caught and each individual examined for sore mouth. All having the disease should be removed and placed in a pen by themselves. While the disease is not highly contagious, it is transmissible, and particularly among suckling pigs, apparently by a healthy pig suckling a teat following a pig with sore mouth. The pigs should be well fed. They should be treated daily by cleaning out the sore, removing all food and dirt, and applying, with a swab, a five per cent solution of carbolic acid or creoline in water (using one part of medicine to twenty parts of water). Another excellent remedy is to clean and dry the sore and apply pure tincture of iodine with a small swab. In severe cases it may be necessary to cauterize the sore once with a piece of "lunar caustic" and then use the carbolic acid solution. This should be done thoroughly. Care must be exercised in treating pigs that they do not bite the operator. Their teeth are sharp and a bite is liable to transmit some infection. It is a good plan to place a clean stick or corncob in the pig's mouth while treating it, to avoid injury to the operator. Pigs that are kept in damp, muddy quarters are more liable to suffer from sore mouth, or bull nose.—(Va. B. 189.)

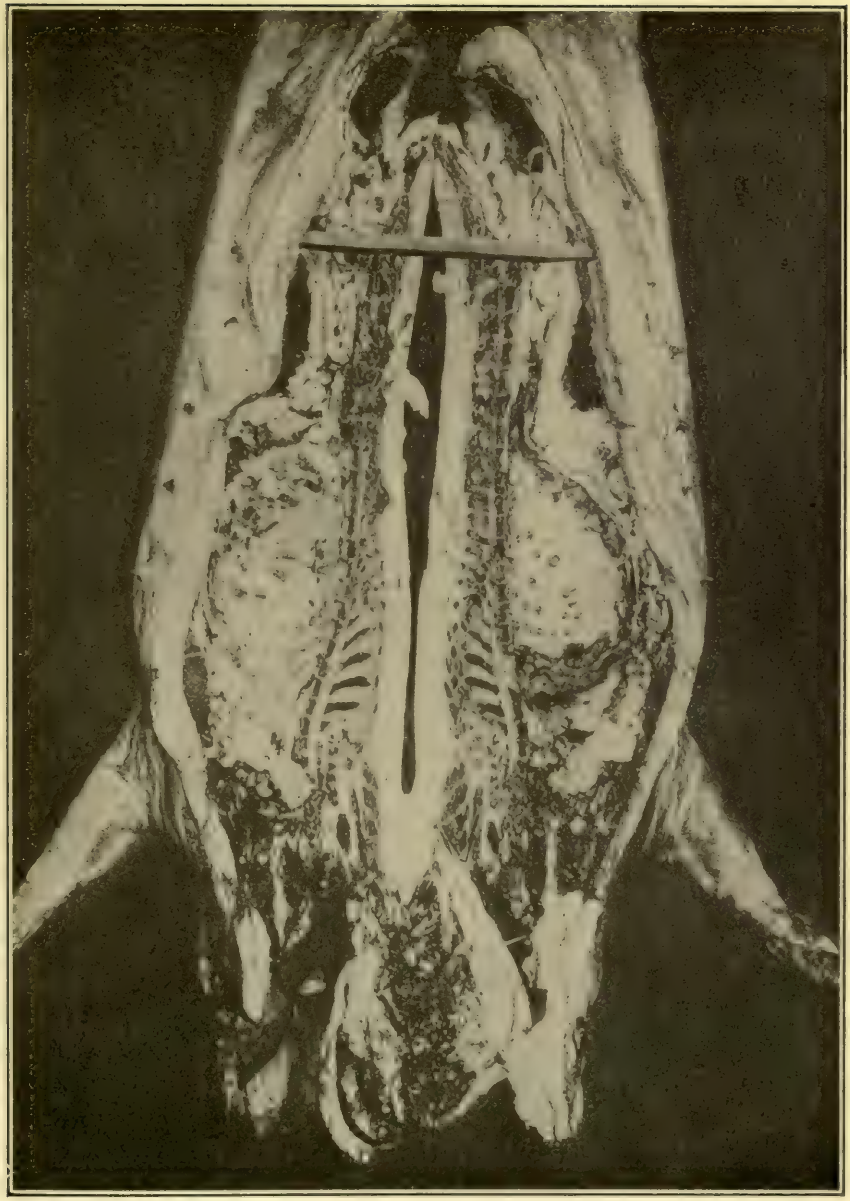
CONTAGIOUS AND INFECTIOUS DISEASES.

HOG CHOLERA.

Description.—Hog cholera is an acute febrile disease which, so far as is known, affects only hogs, and which is characterized by extreme contagiousness and a very high death rate. It is usual to speak of two forms of this disease. One is called the acute and the other the chronic form. This is because of the fact that in some cases the disease is sudden in its onset and rapid in its course, whereas in others the affected hogs linger for weeks or months before death or recovery. Notwithstanding the dissimilarity in the symptoms and lesions observed in these two types of hog cholera, the causative agent is the same in both, the difference in the manifestations of the disease being no doubt due to a variation in the virulence of the germs which cause the disease, and possibly to some extent also to a variation in the resisting power of hogs.

Prevalence.—Hog cholera is found in practically all parts of the world, and is especially prevalent in the large hog-raising districts of the United States. The first recorded outbreak in this country occurred in the year 1833 in the State of Ohio, and is supposed to have arisen through the importation of hogs from European countries, where the disease, no doubt, existed prior to its appearance in this country. From the original center of infection the disease has gradually extended to all portions of the United States, the spread being usually along the lines of transportation. Owing to the former limited facilities for communication between the Eastern and the Pacific Coast States, the latter section remained free of this disease until within the last few years, but reports received recently show that the disease now exists there, and at the present time no section of the United States may be regarded as free from hog cholera. Enormous losses are caused yearly in the large hog-raising States of the Middle West, and it may be safely said that several of these States lose yearly an average of more than $1,000,000 each from this source alone. While outbreaks may occur at all seasons of the year, the great majority take place during the late summer and fall. The mortality from hog cholera is as high as 100 per cent in some herds, while the average is probably from 70 to 80 per cent, and many of the hogs which survive are comparatively worthless, owing to their being weakened and stunted in growth.—(F. B. 379.)

Cause of Hog Cholera.—The germ or microbe which causes hog cholera is present in the blood of sick hogs and also in the excretions from such hogs, particularly in the urine. It has been shown that the disease can be produced almost without fail by inoculating well hogs with the blood or urine from sick hogs. The germ which is in this blood and urine is so small, or else of such structure, that it can not be seen with the strongest microscopes now available. It has never been cultivated in laboratories, as has been done with many other infectious germs, and we know of it only by the effects which it produces. The germ of hog cholera is therefore classed with the "invisible micro-organisms," and in this respect it resembles those which bring about a number of other diseases of animals and men,



Tuberculous hog Carcass, Showing Enlarged Glands of Throat and Tubercles on the Ribs. Y. B. 1909.

notably yellow fever, contagious pleuro-pneumonia, South African horse sickness, and foot-and-mouth disease.—(F. B. 379.)

Predisposing Causes.—While the specific cause of hog cholera is the minute micro-organism or germ just referred to, there are many factors which may render a herd more susceptible to the disease. In general, anything which tends to lower the health of the animals may be regarded as a predisposing cause. Among such predisposing factors there may be mentioned improper feeding, an insanitary condition of the hog lots, damp or cold sleeping places, and dirty drinking and feeding troughs. Of course insanitary surroundings and poor feed can not in themselves produce hog cholera, but they lower the vitality of hogs to such an extent that they become comparatively easy victims of any disease-producing germs to which they are exposed.—(F. B. 379.)

Manner of Infection.—Although the conditions just mentioned undoubtedly exert considerable influence upon the relative resisting powers of hogs to hog cholera, the disease can be started in a herd only by introducing the germ which causes it. This germ is always present in the bodies of sick hogs, and is thrown off from them in large numbers in the feces and urine, thus contaminating the yards or pens in which sick hogs are kept. The most dangerous factor in spreading hog cholera is, therefore, the sick hog; but any agency which might serve to carry a particle of dirt from infected yards may be the means of starting an outbreak of the disease.

Sick hogs may get onto a farm (1) by escaping from a neighboring herd, (2) by the purchase of new stock which may show no symptoms of sickness until some days after purchase, (3) by returning show hogs to the herd after visits to fairs or stock shows, (4) by purchase of hogs which have apparently recovered from hog cholera. The risk incurred by purchase of new hogs or the return of hogs which have been shown at fairs is chiefly due to the fact that such hogs are generally transported by rail, unloaded in public stock yards, or driven along public roads. It is well known that sick hogs are frequently shipped by rail, and the roads over which they are driven, the stock yards, and the railroad cars thus become contaminated with the germs of hog cholera.

When healthy hogs are placed in such cars or yards or driven along public roads they almost always have the opportunity to contract the disease, but the intervals between shipment and delivery to the purchaser is so short that the symptoms do not appear until a week or more after delivery, when it is usually too late to prevent the spread of disease to hogs already on the farm. Obviously, the only safe plan in such cases is to place all new arrivals in lots entirely separated from those occupied by the main herd and to keep them isolated until all danger of their developing hog cholera has passed.

Aside from the danger of introducing infection through the hogs themselves it must be remembered that the germ of the disease, which as already stated is infinitesimally small, may be transported in a minute particle of dirt on the feet of attendants or neighbors who have previously visited farms where hog cholera exists. It may also be carried in this way by dogs, and by crows and other birds. It has been claimed, and considerable proof has been brought to show it, that the disease may be carried downstream from herds which are affected above. It is therefore well to avoid placing hogs so that they will have access to streams which pass through other farms. As diseased hogs are frequently transported by rail, it is quite possible for infection to be introduced into a farm by litter dropped from cars in transit, especially if hogs on the farm have access to the tracks.

After hog cholera has visited a farm, the lots, hog houses, feeding troughs, and implements used for cleaning have naturally become contaminated with the germs of the disease, and if new stock is placed in such yards soon after these were occupied by sick hogs the new hogs are very likely to contract the disease, but if such yards are left unoccupied the germs will die out after a while. Unfortunately it is not possible to tell with certainty just how long a time is required for these germs to die out, this uncertainty being due to the fact that conditions on different farms vary widely, and also because the weather conditions, which have an important influence upon the vitality of the hog-cholera germ, vary from time to time and in different sections of the country. In view of this uncertainty it is safest to wait as long as possible before placing new hogs in lots that have been infected. Such premises should not be restocked sooner than three months after the last pig has been removed. Before restocking, the premises should be cleaned and thoroughly disinfected.—(F. B. 379.)

This being a contagious disease, it follows that the germ of cholera must be carried into a herd before they can contract the disease. It is distributed somewhat on the same plan as are those of typhoid fever, scarlet fever or diphtheria in the human race. The germs are present in the blood and tissue of the affected animals, and are thrown off through every avenue of the body, especially through the urine and feces. In this way they infect the whole yard in which the hogs are kept, and also everything in the yard and pens. The smallest particle of dirt—so small that it cannot be seen, will carry enough germs to infect several herds of hogs.

Conditions Favoring the Disease.—These are crowding during cold weather in the sleeping quarters, especially where different sized animals are kept in the same pen. The smaller pigs become too hot, and then very easily catch cold. Damp, filthy, dark pens where little fresh air or sunshine can reach. Sleeping in a draft under buildings or windows; a pig requires twice the breathing space for every hundred pounds of his weight that is needed by either the horse or cow. Too much green corn. Too close or inbreeding.

The accumulation of vermin on the animal itself or in the pens. Too exclusive a corn diet. The hog being frequently a scavenger, following the cattle in all kinds of mud, filth and dust, is liable to breathe the germs of irritant dust and the lungs become infected with tuberculosis or other debilitating disease germs. In fact anything that has a tendency to weaken the system of the animal renders him a more fit subject for hog cholera.

While the disease has no respect for the age, size or breed of hogs when it once starts in a herd, it is usual for an outbreak to begin with the younger pigs and later to attack the more mature animals. But this is not always true. Hog cholera is most prevalent in the fall of the year and early winter. During the cold weather the cases, as a rule, become more chronic, do not die so suddenly, and a greater per cent of them get well.—(Kan. B. 163.)

Symptoms.—Hog cholera is generally prevalent during fall and early winter. It is an infectious disease in which the lymphatic glands, intestines, lungs, kidneys, and liver are generally inflamed. The inflammations are hemorrhagic in character, the lymphatic glands assuming a grayish-red character, while the discoloration in other organs and tissues may vary in size from very small red spots to large irregular dotted areas.

There are two forms of hog cholera: acute and chronic. In acute form the disease is very virulent and animals affected die from within a few hours to a few days after showing characteristic symptoms. In chronic form the disease does not seem to be so virulent and usually lingers from a few weeks to even months; animals finally dying in an emaciated condition or recovering in some few cases. The length of time required for hogs to become sick after being exposed to the disease varies from 6 to 14 days or may be even longer.

Lack of appetite may be the first disorder noted, followed by rapid and labored breathing. Animals infected may be found lying in their beds showing little disposition to move, and upon being forced to walk show weakness in their hind quarters, a staggering gait with arched back, and after moving about for a time may fall sprawling with labored breathing showing in the flanks. Constipation at the outset is usually followed later by diarrhea. Purplish and reddish discoloration of the skin appear on the under side of the belly and behind the ears, especially noticeable on white pigs. The normal temperature of the hog is 103 degrees F., but in cases of hog cholera it may be as high as 105 or 106 degrees and occasionally higher. Some pigs die before showing few if any outward symptoms of the disease.—(N. J. L. S. C. Cir. 1.)

The beginning of hog cholera in a herd is marked by the sickness of one or two hogs. There is nothing particularly characteristic in the symptoms displayed, and the presence of the disease may not be suspected until a week or two later, when other hogs are attacked. As the number of sick hogs increases the opportunities for the well animals to contract the disease are multiplied, and in a comparatively short time all hogs exposed to the contagion will be attacked.

The symptoms observed in particular cases will be influenced by the virulence of the germ which is responsible for the attack, and also by the resisting power of the hogs in the herd. If this resisting power is low, or if the germ which is the cause of a particular outbreak is of high virulence, we may have in such a herd a typical manifestation of the acute type of hog cholera. In this acute type, the chief symptoms observed are sluggishness, disinclination to move, weakness, loss of appetite, a high fever, inflammation of the eyes with the gumming of the lids, and there may be diarrhea. If the sick animals are examined carefully, red or purplish blotches may be seen on the skin, especially over the surface of the abdomen, on the inside of the legs, and around the ears and neck. As a rule the progress of the infection is so rapid that the hog is not greatly emaciated before death; it is, in fact, usual in acute outbreaks for hogs to die after being sick only a few days.

In the chronic type of the disease the symptoms are quite similar to those seen in acute cases. The sick hogs are sluggish and disinclined to move when disturbed, and coughing is frequently heard when they are suddenly roused. They may eat very little and usually lose flesh rapidly, finally becoming so emaciated and weak that they stagger or walk with an uncertain gait, the hind legs particularly appearing to be very weak. The eyes, also, become inflamed and the lids may be gummed together. After the first few days of illness there is apt to be a profuse diarrhea, and in these chronic cases the hog may, and usually does, linger for several weeks, sometimes months, before it finally dies. It is extremely rare for such an animal to recover its health and vigor sufficiently to become of value to the owner.

Cholera usually starts with a diarrhea. The pigs quit feeding, many have a cough and are dumpish for several days, lose all energy, gradually become weaker and die. The older hogs act in the same way, except that they do not usually become so thin before they die. Sometimes a constipation precedes the diarrhœa for a longer or shorter period. The discharges are usually very offensive. There is frequently a discharge from the eyes which resembles pus, which may be sticky enough to gum the lids together. In many outbreaks one or two hogs may not feel well for several days, and before the owner is aware of the fact the whole herd may be infected and a greater or less number die every day. Some may show symptoms of a severe illness, such as fever, weakness, loss of appetite, diarrhœa, redness of the skin of the abdomen or flanks and in patches around the snout or ears, while others may show but a few of these symptoms before death.—(Kan. B. 163.)

It will thus be seen that before death the appearance of hogs affected with hog cholera is not particularly characteristic, for the symptoms, especially in acute cases, are only such as might be expected in a severe disease of any kind. But if these symptoms are noticed in a herd of hogs, and if the disease is seen to be contagious, showing a tendency to spread from the sick to the healthy animals, it is likely that hog cholera is present, though in order to be sure of this a post-mortem examination must be made.—(F. B. 379.)

Appearance of a Hog After Death from Hog Cholera.—In regard to the examination of hog carcasses on the farm, it may be well to state that while hog cholera is not communicable to man, there is always danger of the hog being affected with other diseases, such as tuberculosis and anthrax, which are highly dangerous to man, and for this reason care should be exercised in examining carcasses of sick hogs so as to avoid a cut or scratch on the hands which might serve as a point for the inoculation of disease.

The post-mortem examination of a hog should begin with the skin, which may show the red or purplish blotches which have been mentioned above as one of the symptoms of hog cholera. When the examination of the skin has been made, the organs of the body are examined in the following manner: The hog is laid on its back, and, beginning at the throat, an incision is made along the middle of the chest and belly, through the skin and underlying fat, and extending the entire length of the body. The next step is to dissect back the skin of the chest so that the ribs are exposed. Now, beginning at the lower border of the ribs, about 1 or 2 inches on either side of the breast bone, and cutting toward the head, the ribs on both sides are severed, the central portion, including the breast bone, being removed entirely. Crosswise incisions, extending from the first long incision toward each leg, are now made in the skin in such a manner that this may be laid back on both sides of the body, thus exposing to view the various organs which lie in the chest and abdominal cavities. While the carcass is being opened, care should be taken to avoid injuring the organs. The important organs are examined as follows:

Lungs.—The healthy lungs are pink in color, soft, and filled with air. Occasionally, in that portion of the lungs nearest the neck, small, solid, dark areas may be seen in healthy hogs. Such areas without other lesions are not to be regarded as indicating hog cholera. In acute cases of hog cholera the surface of the lungs frequently show numbers of small red spots of varying size which are caused by the rupture of minute blood vessels, thus allowing the blood to escape into the tissue. These spots can not be washed off with water and when found are an important indication of hog cholera. It is not unusual to find that large portions of the lungs are consolidated, and instead of being soft, filled with air, and pink in color, as is the case in normal lungs, the organs are heavy, solid, and of a grayish or dark-red color. This consolidation of the lungs is not so characteristic of hog cholera as the reddish spots mentioned above.

Other Organs.—The heart is inclosed in a thin membranous sac which can be easily slit open and removed so as to permit a satisfactory examination of the organ. In cases of hog cholera, the surface of the heart may show bloody-looking blotches similar to those seen in the lungs and which, like those in the lungs, can not be washed off with water. These bloody spots on the heart are rarely seen except in very acute and virulent forms of hog cholera. In cases of hog cholera the liver generally shows no marked change from the normal condition. It may be at times darker than normal in color, and if cut with a knife blood will exude. This indicates simply that the organ is congested. In some cases the liver may be of a light-grayish color, due to the increase of fibrous substances. Neither of these conditions is especially characteristic of hog cholera.

The spleen, or melt, which is found on the right-hand side of the hog's body as viewed at autopsy, lying a little below and to the right of the stomach, is in acute cases of hog cholera found almost without exception to be quite large, dark, and soft. In the prolonged, chronic cases, however, the spleen may be even smaller than normal and rather grayish in color. The kidneys, which lie beneath the intestines as viewed at autopsy, can be easily removed by pulling aside the soft fat and tissues which surround them and cutting the round tube which holds them to the body. The thin fibrous tissue which surrounds the kidneys should be carefully peeled off without cutting into or injuring the organ, and if the case is one of acute hog cholera, it is very likely that the normal light-brown color of the kidneys will be found to be changed to a much darker color, and there may be seen over the surface a number of very dark-red points, some of these no larger than a pin point, whereas others may be larger than the head of a pin. The appearance of the kidneys frequently reminds one of the speckling of a turkey's egg. These spots are caused by the escape of blood from the small blood vessels in the same way as the larger reddish spots which occur in the lungs and on the heart. Both kidneys should be examined.

Stomach.—The stomach is the large white pouch-like organ which is situated in the upper part of the abdominal cavity next to the lungs and by the side of and partly underneath the liver. Usually the external surface of the stomach shows no change from normal, though occasionally there may be observed small red spots similar to those which have been described as appearing in the lungs, heart, and kidneys. The stomach should be opened by cutting the front wall from one end to the other. The partly digested food which is usually found within the stomach is removed and water poured in so as to clean the inner surface and permit a satisfactory examination. The normal stomach lining is a uniform, rather wrinkled, pinkish-looking membrane. It is smooth and free from distinct hemorrhages. In cases of hog cholera it is not infrequent to find large portions of this lining membrane of the stomach very much inflamed and red, and a careful examination will frequently show that this lining membrane has been ulcerated. The ulcerated portion usually extends over a considerable area of the lining membrane of the stomach and is separated from the healthy portion by a more or less distinct line.

Small Intestines.—The intestines are connected directly to the stomach. The small intestine is that portion which begins at the stomach and continues until a distinct union is made with a portion of the large intestine known as the cecum or blind gut. In normal hogs both the outer and inner surfaces of the small intestine resemble considerably those of the stomach, though of course the walls of the intestine are not nearly so thick. The small intestine is well supplied with small blood vessels which can be distinctly seen. In some acute and virulent types of hog cholera the outer surface of the small intestine may be literally covered with bloody spots, giving one the impression that blood had been spattered over these organs, but upon washing them with water it will be found that these bloody areas can not be removed. There is no other characteristic lesion of the outer surface of the small intestine. The inner lining, however, may at times, in cases of hog cholera, be congested and inflamed, so that the normal wrinkled inner surface is greatly thickened and covered with a yellowish exudate or coating, or it may be dotted with small bloody spots like those seen on the outer surface of the intestine.

Large Intestines.—The large intestine differs markedly from the small intestine in general appearance, being larger in circumference and of more uneven surface. The appearance of the large and small intestines in health and their relative positions in the body are easily distinguished. In cases of hog cholera the outer surface of the large intestine may show the same hemorrhagic spots that have been mentioned as occurring on the small intestine, but it is the inner lining that shows the most important changes.—(F. B. 379.)

An autopsy in all forms of hog cholera may be necessary to fully establish the cause of death. Besides the skin showing red or purple blotches, the fat under the skin may show red bloody spots, usually very small, which cannot be washed off with water. Quite frequently portions of the lobes of the lungs may be collapsed, resembling the liver in appearance and touch. In acute cases small red spots due to rupture of the small blood vessels in the lungs appear, and when found are a sure indication of hog cholera. The lung consolidation is not as characteristic a symptom as the small red spots.

In acute forms small bloody spots may be found on the surface of the heart similar to those in the lungs. The liver does not usually show any marked change from normal conditions. The spleen, as viewed in autopsy, in acute cases, is quite large, dark and soft. In prolonged chronic cases it may be smaller than normal and grayish in color. The kidneys usually appear spotted with very small red speckles, resembling turkey eggs in appearance, and is considered the most characteristic of hog cholera symptoms. The mucous membrane of the stomach is red and inflamed, and a careful examination will generally show ulceration extending over considerable area, separated from healthy portions by a more or less distinct line. The intestines in acute cases show inflammation and are frequently blood stained. In the slow chronic forms of hog cholera, ulceration of the inner surface of the large and small intestines is found. Especially is this true along the inner surface of the large intestine where button-shaped ulcers varying in size from mere specks to that of a 25-cent piece are to be found. These spots are yellowish in color with dark centers raised above the surrounding healthy tissue. The presence of these ulcers is a positive diagnosis of hog cholera, though in many acute cases they do not have time to develop.—(N. J. L. S. C. Cir. 1.)

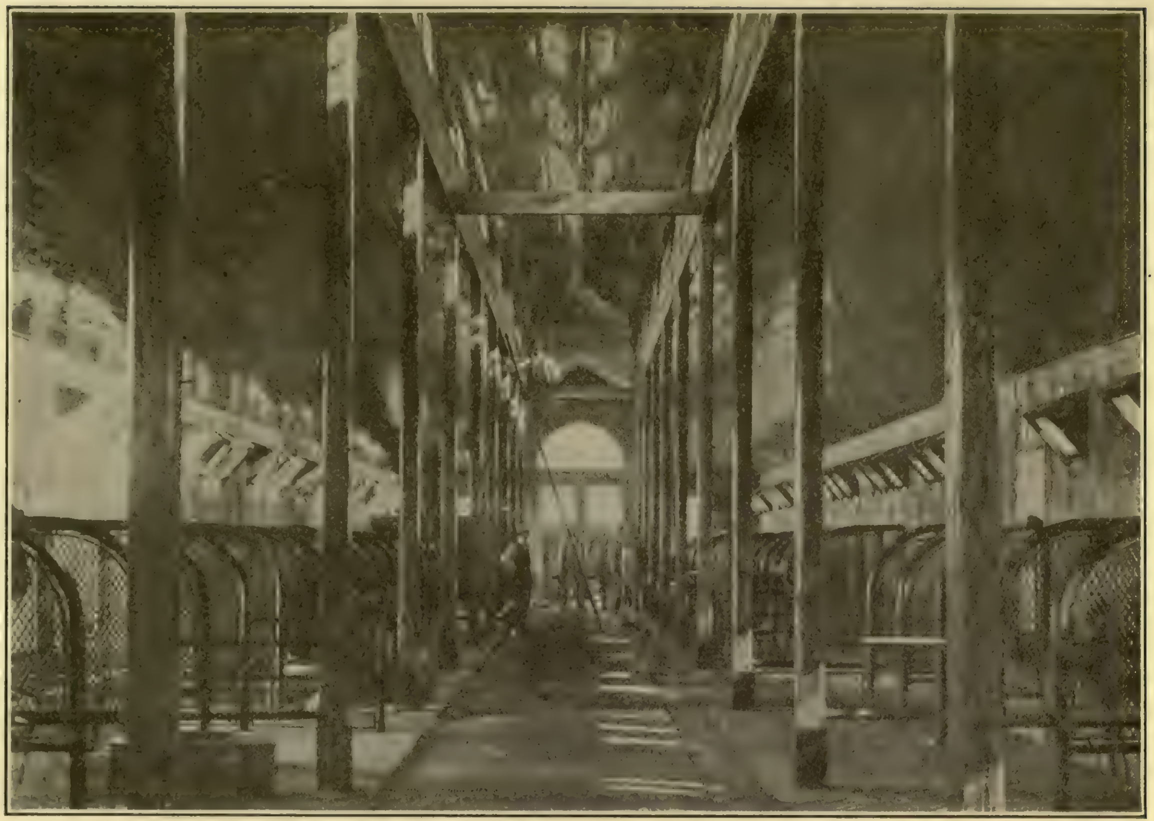
Care should be taken to prevent blood poisoning of the operator as a result of the post-mortem of any animal. If a person has any sore on his hand he should not touch a dead animal, or if he should receive a cut or scratch during the examination the hand should be placed in pure kerosene at once, the sore well filled and the bandage saturated with it.—(Kan. B. 163.)

Diagnosis.—From what has already been said of the symptoms exhibited by hogs sick of hog cholera, it will be recognized that at the beginning of an outbreak in a herd it is a difficult matter to be sure that hog cholera is actually present, for the outward symptoms are not characteristic, but only such as might be expected in any acute disease. The same may be said of some of the changes which take place in the internal organs. It is therefore necessary to consider all of the features of the disease before making a positive decision concerning the presence or absence of hog cholera in a herd. The important features of hog cholera are: 1. Contagiousness. 2. Symptoms of severe illness, such as fever, weakness, loss of appetite, and diarrhea. 3. Hemorrhagic spots in the internal organs or button-like ulcers in the intestines. If these characteristics are found in a disease of hogs in this country, we may be reasonably certain of the presence of hog cholera.—(F. B. 379.)

VACCINATION FOR CHOLERA.

Immunity.—It is a well recognized fact that where an animal has recovered from a contagious disease, as sometimes happens, such an animal is very unlikely to be attacked a second time by the same disease, even when exposed to it with impunity. In other words, we say that such an animal is no longer susceptible to that particular disease, or, that it has become immune. What this immunity consists of, and just how it is brought about, has been the subject of much discussion and many theories have been evolved to account for it which need not be taken up here. It is evident, however, that the body fluids, blood and lymph for instance, in such an immune animal have acquired some property or substance which they did not possess, or only to a limited degree, before being attacked with the disease. It may be well to explain here that there are two forms of immunity—an active and a passive form. An active immunity is developed where an animal has become infested with the disease-producing organism itself (provided recovery takes place) as in such cases the various body cells are stimulated to develop their own antitoxin and this form of immunity is the most permanent and for that reason is the most desirable. Passive immunity is obtained by injecting direct a quantity of the antitoxin and is relatively of short duration, depending upon the rapidity of its elimination. Probably the most familiar instances of these two types of immunity are those occurring in the practice of human medicine in which the active form is well illustrated in the vaccination against smallpox, while the use of diphtheria antitoxin will illustrate the passive form.

Hyper-Immunity.—We have said that an animal recovered from a contagious disease has developed an immunity; such an animal, however, probably only possesses a sufficient amount of immunity in its whole body to protect itself, and its serum, therefore, would be of little value in small quantities for the immunizing of other animals. It has been found, however, that the immune animal can be safely injected with enormous amounts of virulent blood (blood



Interior of Barn at Animal Quarantine Station, Athenia, N. J. B. A. I. 1902.

from an acute case of the disease) and after such treatment the blood becomes highly charged with antitoxin so that a comparatively small amount of the serum of such blood may be used for the protection of other animals. This process is called hyper-immunizing, the animal so treated being designated as a hyperimmune, and it is this principle that has been taken advantage of so successfully by Drs. Dorset and Niles in the treatment of hog cholera, the results of their work being published in Bulletin 102 of the Bureau of Animal Industry.—(S. C. B. 152.)

Use of Immune Hogs.—An immune hog is injected with large amounts of blood from hogs sick with hog cholera. These injections will not produce more than a transitory effect upon the health of the immune, although they would prove certainly fatal to a susceptible hog. This treatment of immune hogs with large amounts of virulent blood is known as hyperimmunization, and gives to the blood of the immune the power to protect susceptible hogs from hog cholera. After a week or so, when the immune has recovered from the effects of this treatment, blood is drawn from that animal by cutting off the end of the tail. The blood drawing is repeated three or four times at intervals of a week, after which the immune is usually bled to death from a carotid artery. After each drawing from the immune the blood obtained is defibrinated and mixed with a suitable antiseptic. If preserved in sterile bottles,this defibrinated blood, or serum, as it is called, will retain its potency for years. The protective serum having been obtained from an immune hog in the manner indicated, the potency of this serum is determined by injecting susceptible pigs with varying amounts, and at the same time exposing them to hog cholera along with untreated control animals. In practice it will of course be found best first to collect large quantities of serum and to mix this before testing. A standard serum will thus be secured at a minimum cost. A standard serum of known potency having been secured, either of two methods may be used for protecting susceptible pigs. These are known as (1) the "simultaneous" method, and (2) the "serum-alone" method, or simply the serum method.—(B. A. I. 25th An. Rept.)

Practice Briefly Stated.—Animals that have recovered from hog cholera or have been immunized by inoculation, are thereafter considered immune. These pigs are then injected with large amounts of blood taken from a hog sick with hog cholera to make them hyper-immune, that is, increasing the properties in their blood to overcome or resist the disease. They are then bled from the tail at intervals of a few weeks. After several bleedings, they are reinoculated with virulent blood perpetuating the hyper-immunity. This can be carried on until the tail is consumed when the pig is bled to death; the blood collected and one-half per cent carbolic acid added to preserve the serum.—(N. J. L. S. C. Cir. 1.)

Details of Serum Production.—The hog is first covered with a sterile cloth to prevent any dirt or germs from dropping into the vessel which collects the blood as it is drawn from the animal. The tail is shaved closely, then thoroughly sterilized with a strong antiseptic solution before each bleeding. The blood is immediately taken to the laboratory and defibrinated, leaving only the fluid part of the blood, which we call the serum. To this serum is added a small amount of a weak solution of carbolic acid to partially preserve it. It is then stored in a cool place until tested on some pigs, when, if it proves potent, it is ready for use.

Before the hog is ready to be bled for this serum it must first undergo the process of hyperimmunization—that is, his blood must be brought into a condition so that when it is drawn and injected into other hogs it will prevent them from taking the cholera. For this process one is taken which is immune to cholera—that is, it has either recovered from a case of cholera or has been vaccinated against the disease, and will therefore not take the disease again. Into this animal is injected, through the veins of the ear usually, five cubic centimeters of virulent blood for each pound of weight of the hog; for instance, a 200-pound hog receives 1,000 cc. of virulent blood. After ten days the hog is ready to produce blood for serum and is bled usually three times more at intervals of seven days, and if the tail holds out he is then rehyperimmunized and again bled two or three times, the same as before. In either case at the last bleeding the hog is killed and all of his blood taken. The serum from all of these drawings is mixed together and its potency tested. If it is potent, it is ready for use. This is necessary as the serum from the last drawing is usually less potent than that from the first drawings, and after it is all mixed together it should be a serum of average potency.

The amount of serum produced from each drawing varies with the size of the hog, with his condition, the character of the weather and the manner in which the animal has been fed and cared for. A 200-pound hog will produce usually 600 cc. of serum at each bleeding, or a total of 3,000 cc.—the last bleeding when killed usually yields 1,200 cc. of serum.

It takes much practice and patience to inject such a large quantity of blood into the ear vein and also to draw such a large quantity from the tail of the hog. All of these operations must be done with thoroughly antiseptic precautions, to produce potent serum and to prevent injury to the pig itself or accidents to the serum.

To produce virulent blood enough to hyperimmunize a 200-pound hog requires three or four pigs weighing about forty pounds. They must be given a severe form of the disease and must be ready to kill at, or near, a certain time, as the virulent blood must be used for this work within a few hours after drawing. Again, in testing the serum it is necessary to use several more pigs. These are not all a total loss as it is usually possible to save their blood by killing them when they are about to die with the disease. Here again is the knowledge of the expert required. If the pig is killed too soon, the blood is not virulent enough for use, and if allowed to go too long before killing, the pig is liable to die and the blood cannot then be used at all. In order to produce this 3,000 cc. of serum it requires one 200-pound hog and about five smaller pigs. This amount of serum will vaccinate about 150 hogs, so that for every 6 pigs sacrificed the lives of 150 are saved, or one pig for 25 (4 per cent).

Experts Necessary to Produce Serum.—Two expert graduate veterinarians with several high-grade helpers are now devoting their whole time to the production of this serum under the direction of the head of the veterinary department. This high-grade help is necessary; it reduces the danger of producing poor serum and also reduces the cost to a minimum as poor serum cannot be used at all.

Cost of Serum and Size of Dose.—After the serum has been tested and found to be potent, it is put up in bottles of three sizes, sealed, and stored in a cement cellar where it can be kept at an even temperature until sent out for use. The small-sized bottle holds 100 cc., or enough serum to vaccinate five shotes weighing from 30 up to 100 pounds. The dose for this size animal is 20 cc. The larger bottles hold 500 cc. and 1,000 cc., respectively, or 25 and 50 ordinary doses.

A pig weighing less than 30 pounds requires only from 10 to 15 cc. of serum. The large hog requires an increased dose, depending somewhat upon his weight and condition. Ordinarily a hog weighing 500 pounds would require at least 60 cc., and the pampered and very fat hog a larger proportionate dose.

At the present time the cost of the serum approximates somewhere in the neighborhood of one and one-half cents per cubic centimeter, at which price it is sold, making the cost per dose for the shote of 100 pounds or less 30 cents for the serum only. As the college has no funds for the production of the serum, it will be necessary to make a charge for it, at least until after the meeting of the next legislature.

Only the actual cost of the production will be charged, however. At this time we have not had enough experience in its manufacture to gauge accurately the cost, and the price fixed above is based on the best information we have in our own experience and on the experience of other states. Michigan charges its farmers two cents per cc., or 40 cents per average dose. Minnesota charges about the same. The Iowa legislature appropriated $8,000 for the manufacture of this serum and they are charging their farmers "about 50 cents for a dose sufficient to inoculate a hog weighing 150 pounds." Ohio has three qualified veterinarians upon this work and they are selling the serum at 25 cents for an average dose.

Every economy will be practiced that is consistent with the production of serum of high protective powers and free from any foreign infection. It is hoped that it will be found possible to produce this serum at a lower cost than thirty cents for an average dose. In any case the price will be determined by the cost of production, and in no case will any profit be charged.—(Kan. B. 163.)

A 125-pound hog will produce about 550 cc. (cubic centimeters) of serum at each bleeding, and at his death 1,300 cc., making a total of 3,500 cc. The dose for a 125-pound pig is about 30 cc., so that the average total production from a 125-pound hyper-immune pig is about 115, 30 cc. doses. When it is known that it takes the blood of a cholera pig of equal weight to hyper-immunize every pig used for the production of hog cholera serum, some idea of the cost is at hand. Other expenses are losses from death of pigs producing hog cholera blood before they are bled; also from death of pigs used to test potency of the serum produced before it is sent out for use.—(N. J. L. S. C. Cir. 1.)

At the present time it is impossible to state definitely just what the cost of this serum should be. This will undoubtedly vary in different localities, depending upon local conditions, such as the price of hogs, the cost of feed, and similar minor considerations; but it has been estimated, and this estimate has been confirmed by at least one of the States now conducting this work, that the serum can be made for 25 cents a dose. We do not regard this as the minimum limit of cost for the serum production, but rather hope that with increased knowledge of the disease and wider experience with the serum production this estimate will be materially reduced.—(F. B. 379.)

It is gratifying to be able to state positively that epidemics of hog cholera can now be successfully controlled by a process of vaccination.—(Tenn. B. 85.)

Two Methods of Vaccinating.—The first method is to use the serum alone. In this method there is simply injected into the muscles of the hog a dose of the anti-hog cholera serum, which makes the hog immune against cholera for a time varying from a few weeks to several months. This is the method used when, for instance, a very fat show herd is vaccinated. It is absolutely safe. It is also used in herds where the cholera already exists and some of the animals have been exposed only a few days. After the disease has been in a herd for three or four days, vaccinating seldom does any good. Thus the earlier the vaccination in these cases the more certain the results. A day's time here may mean either the losing or saving a large part of the herd.

Where vaccinating is done in diseased herds, the amount is increased from one-half to double the regular sized dose. The second method is one in which there is some danger, but the results, if the animal survives, renders it immune for the rest of its life. It is the so-called serum simultaneous method, in which there is injected at the same time, in addition to the serum, a small amount of virulent blood or blood taken from a hog very sick with the cholera. This method really gives the hog a very slight form of the disease and as a consequence the animal does not take the cholera the second time —it has been artificially immunized. This is the most satisfactory method to use in a healthy herd, or before they become infected. Great care is necessary that too much of the virulent blood is not used. If the dose is too large the result may make the hog quite sick, or even cause death.—(Kan. B. 163.)

The serum alone method produces an immunity lasting 3 to 6 weeks, the one in which the serum is used in conjunction with 2 to 3 cc. of fresh blood obtained for a hog sick with hog cholera, known as the serum-simultaneous method, produces an immunity which is considered practically permanent. When injecting in the second method it is best to use separate syringes, injecting the serum in one thigh and the virulent blood in the other. The serum from a hyperimmunized hog also possesses some curative effect when used very early in the disease. There is little or no danger in spreading the disease when vaccination is properly carried out. The practical application of vaccinating against hog cholera is not by any means a difficult problem, when once the serum production has been perfected in a given state. This, however, as already indicated, necessitates an expenditure of a certain amount of money for the equipment of premises, for hogs, and for qualified men. But the expense is not so great, when the annual losses from hog cholera are considered. The hyperimmune hogs after the final bleeding may be used for food purposes. Vaccination to produce temporary immunity, as above outlined, is very simple, consisting in the subcutaneous injection of the serum alone. This may be easily done by the average intelligent farmer, and is of special use when shipping hogs from one place to another, as is frequently done with show animals. The serum-simultaneous vaccination, to produce a permanent immunity, is more complicated, since it calls for the bleeding of diseased hogs to obtain the virulent blood. This latter method will demand trained men who can be sent to the seat of different outbreaks of hog cholera.—(Tenn. B. 85.)

Vaccinating Instruments.—Two hypodermic syringes are used in vaccinating. One for the serum which holds 20 cc., and one for the virulent blood holding 5 cc. The two sizes are used to prevent any mistakes being made. A thermometer is used for taking the temperatures, as we make it a rule not to use virulent blood if the temperature is high, using only the serum.

Strong antiseptics are also used to disinfect the point of injection, especially where the virulent blood is injected. If this is not done the small particles of a drop or so on the end of the needle may infect the whole premises. This is very important.—(Kan. Bul. 163.)

Simultaneous Inoculation.—In this form of vaccination the same serum is used as is employed when the serum alone is used, but in addition to the serum there is injected on the opposite side of the body, in the same manner as the serum, a very small amount of blood taken from a hog sick of hog cholera. This simultaneous injection of serum and virulent blood confers upon the injected pig a permanent and lasting immunity, and is therefore to be recommended in cases of well herds which may not be exposed for some months after the treatment.—(F. B. 379.)

To give hogs permanent immunity against hog cholera, a dose of blood from a virulent case of hog cholera is injected beneath the skin of the hog, and at the same time the serum from a hyper-immune hog is injected. This is called the "Serum Simultaneous" method. There is a considerable risk associated with the use of virulent hog-cholera blood, hence the "Serum Alone" method is the one commonly used. The "Serum Alone" immunization can be applied by any intelligent person, but the "Serum Simultaneous" inoculation requires the services of an expert. The cost of hog-cholera serum is considerable, usually varying from fifteen to fifty cents an animal, depending upon the size. As the immunity conferred is for about six months only, it is not practicable, usually, to vaccinate hogs except when hog cholera is in the locality, or there is a possibility of infection from other sources. The Commonwealth of Virginia supplies hog cholera serum at cost to Virginia hog raisers through the Commissioner of Agriculture, Richmond, Va., to whom application for serum should be made. After an outbreak of hog cholera, non-immune hogs should not be placed in the same yards or corrals, until at least three months' time has elapsed.—(Va. B. 189.)

The pig is injected subcutaneously with proper amounts of serum and virulent blood. This method is used where the disease does not exist or where it has just started. The immunity resulting therefrom lasts longer than from use of serum alone, usually from 6 months to one year, or perhaps for life. There is considerable danger from using this virulent blood method, as the practice has been known to start outbreaks of hog cholera. Veterinarians only should conduct the treatment. It is not generally recommended by investigators at the present time.—(N. J. L. S. C. Cir. 1.)

The safety of this mode of vaccination is manifestly a condition of vital importance if it is to be used in herds not already infected. In the use of a living virus as a vaccine there is, necessarily, a suspicion that it may under certain conditions beget a plague instead of suppressing one. A vaccine which has proved safe in its application by its originators, may be very unsafe when applied indiscriminately by farmers or even by veterinarians.—(Ark. B. 105.)

Serum Alone Inoculation.—The serum-alone method, which consists simply in the injection of the protective serum without the simultaneous use of virulent blood, appears to confer only a temporary immunity upon the treated pigs, unless they are exposed to hog cholera a short time after receiving the serum, in which case they also acquire a lasting immunity. For these reasons this method is admirably adapted to the treatment of hogs in a herd where hog cholera has already broken out, but which have not themselves shown visible symptoms of disease.

The experiments which are being carried out to determine the curative properties of the serum are not yet complete, but from the results thus far obtained we know that serum in the doses used for immunization can not be depended upon to cure hogs which already show visible symptoms of hog cholera. Neither the simultaneous nor the serum-alone method, when properly applied, appears to injure the hog in any way.—(B. A. I. 25th A. R.)

The hogs which are to be protected are injected on the inside of the hind leg with a suitable dose of the serum alone. This injection will serve to protect hogs from hog cholera for several weeks and, in some cases, for a longer time. But if the hog is not exposed to hog cholera within a few weeks after this treatment, the immunity which is conferred by the serum will gradually lessen in degree and the hog may again become susceptible. If, however, the hog is exposed to hog cholera within a short time after the injection of the serum, the immunity becomes, so far as experiments have shown, of permanent and lifelong duration.

From what has been said it will be seen that the injection of the serum alone is especially to be recommended in cases where there is immediate danger of exposure, especially when valuable hogs are carried to fairs and in herds where the disease has already broken out but has not progressed very far. In herds of this character all of the well animals may be treated, and even in the case of slightly sick animals much good may be accomplished by the serum injection.—(F. B. 379.)

Serum alone vaccination is safe, and its use need be restricted only by its cost and degree of efficiency. In our experiments in the treatment of cholera-sick hogs, it has proved quite useless, but has been used with some apparent success in preventing extension of disease in herds already infected. The problem here is to increase the potency of the serum and diminish its cost.—(Ark. B. 105.)

Each pig is treated with the proper amount of serum, the dose varying with age and size. It is useful with herds where the disease already exists, and is used only on seemingly healthy animals. *It is not a cure,* but a preventative, and of no use to sick hogs. The immunity lasts for a few months only in well pigs; but when used on pigs exposed naturally to the disease, the animals may be considered immune thereafter. It is especially useful and used extensively where pigs are sold, shipped or exhibited at fairs. The usefulness and value of hog cholera serum has long been considered beyond the experimental stage. Its use has been saving over 90% of the animals treated, and thousands have been treated successfully.—(N. J. L. S. C. Cir. 1.)

Because of difficulties which we have experienced when using the "Serum-Simultaneous Method" in the field under different conditions than those under which the serum has been tested, we do not recommend it or permit the virus to pass out of our hands for the present. There is no danger in the use of the "Serum-Alone Method," and we heartily recommend it where hog cholera exists or in cases where immunity is desired for a short period.—(Mich. Cir. 6.)

Handling the Hogs During Inoculation.—Separate the well from the sick or those to be treated from those not to be treated. If possible, mark in some way all the hogs treated or all those not treated so that the results of the treatment may be accurately estimated. The pigs to be treated should be separated according to weight in pens or enclosures, all those requiring the same dose of serum being placed together. The attendant holds the pig by the hind legs with the snout toward the ground and the inside of thighs or hams exposed to the operator. Pigs weighing less than 100 pounds can be easily held in this way. Larger hogs may be thrown on the back with the hind legs spread apart and held securely. Hogs weighing over 200 or 300 pounds can be treated while standing by inserting the hypodermic needle into the muscles on the inside and back portion of the ham, approaching the hog from the rear. An assistant holds the hog firmly by the tail. A hogholder or rope with slipnoose may be placed over the hog's upper jaw, the rope being then snubbed to a fence post. The treatment is not painful to the pigs which usually cease resistance while the injection is taking place.—(Mich. Cir. 6.)

Doses of Serum.—The amount of tested serum to use per animal is approximately as follows:

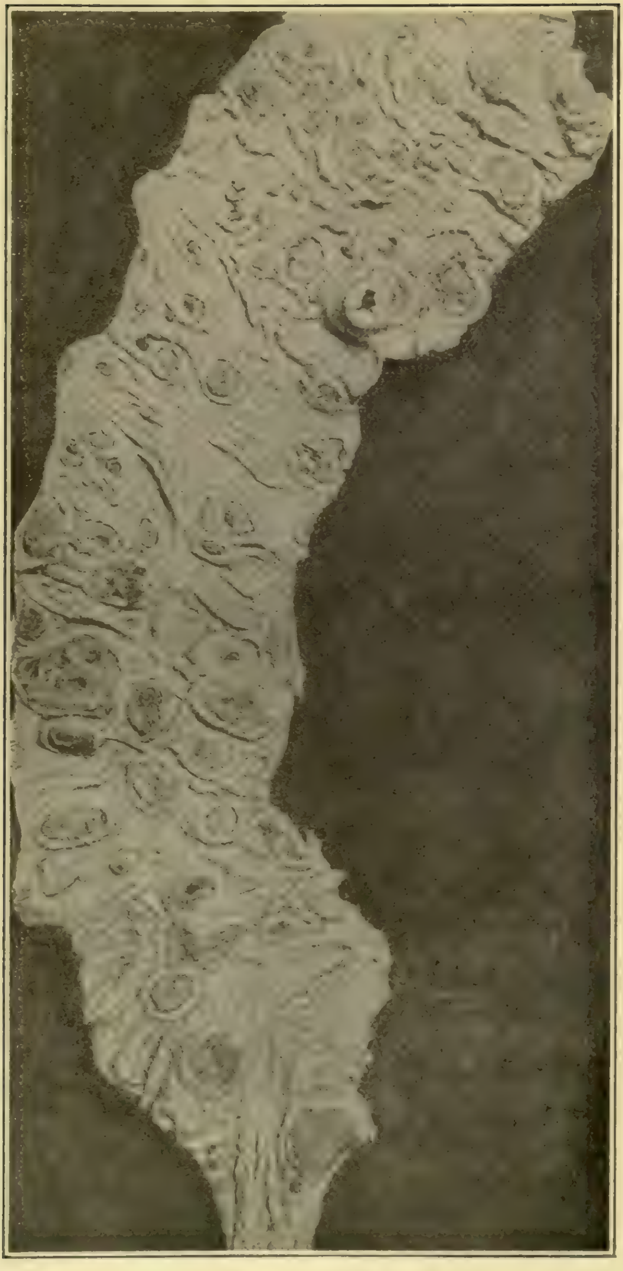
Under	25	lbs. weight	15 cubic centimeters
For	100	" "	25 cubic centimeters
"	200	" "	40 cubic centimeters
"	300	" "	50 cubic centimeters
"	400	" "	60 cubic centimeters
"	500	" "	70 cubic centimeters

—(N. J. L. S. C. Cir. 1.)

Which Method to Use.—Properly prepared serum when used alone, without the employment of blood from a sick hog, is entirely harmless and incapable of giving rise to an attack of hog cholera. Nor does this injection interfere in any way with the growth of the treated hogs. The simultaneous inoculation, involving as it does the use of a disease-producing virus, requires much more care when employed than does the serum-alone inoculation, for, if through careless preparation or from any other cause the serum should be weaker than is required, injury to the vaccinated hog might result. This danger, which is extremely slight when carefully tested serum is used, is met with in practically all processes which are now employed for producing a permanent and lasting protection against infectious diseases, and although it would be very desirable to eliminate even this slight element of danger, we can hardly expect to do this without at the same time sacrificing to some extent the high degree of immunity and the prolonged protection which follows the simultaneous method in its present form.

Practically, in deciding which method to use one must be governed largely by the length of immunity which is required. If this is needed for only a few weeks, or if the treatment can be repeated at short intervals, as in the case of exceptionally valuable pure-bred hogs, where the increased cost would not be objected to, the serum alone may be used. In other cases the simultaneous method is recommended. In either process of vaccination it is considered highly desirable for the treatment to be applied by competent veterinarians who have had special training in this class of work, and only such skilled men should employ the simultaneous process. After treatment by the simultaneous method the herd should be kept under observation for ten days or two weeks, and if any of the inoculated hogs show serious symptoms of disease the herd should be immediately retreated with the serum alone. When properly performed, the simultaneous inoculation does not seem to injure the hog or to interfere with its growth in any way, and if the precautions indicated above are taken it is regarded as safe enough for practical use.—(F. B. 379.)

Results of the Serum.—When the serum is potent and the work properly done, the hog seldom loses a feed. The serum, however,



Hog Cholera (Part of Ulcerated Caecum). Dept. of Agr.

causes a reaction and slight fever in the animal, and for several days the temperature may vary several degrees, sometimes going to 106 degrees and even higher. From 6 to 10 days after vaccination the temperature should be back to normal again, about 103 degrees.—(Kan. B. 163.)

The statements concerning the protective power of serum from hyperimmunized immunes are based upon tests on several thousand hogs. These tests were carried out not only in small experiment pens, but in great part upon farms under practical conditions. During the fall of 1907 approximately 2,000 hogs were treated on 50 different farms, a considerable proportion of untreated hogs being left in all cases as a control on the action of the serum. Both methods of treatment were used, and the herd conditions varied widely. The herds can be roughly classified as (1) those in an infected district, but themselves free from disease; (2) those known to have been exposed by contact with sick hogs, but which had not developed disease at the time of treatment; and (3) herds in which hog cholera was present and hogs were sick and dying at the time of treatment.

In no case were any of the ordinary methods of combating hog cholera by disinfection and separation of the sick from the apparently healthy practiced. Where disease was present at the time of treatment, the treated animals were allowed to run with the sick along with a number of untreated animals which served as controls, and the success following treatment can therefore be attributed to the action of the serum. In the herds where hog cholera appeared subsequent to treatment, practically all of the treated hogs remained well while more than 65 per cent of the checks died. In the herds which had been exposed but were apparently well at the time of treatment, 4 per cent of the treated animals died while approximately 90 per cent of the checks succumbed. In the herds where disease existed at the time of treatment, and where very great success was not expected, 13 per cent of the treated animals were lost, whereas 75 per cent of the checks died.

These successful field trials, confirming as they do numerous tests carried out under experimental conditions, have convinced us of the efficiency of this method of dealing with hog cholera; and although improvements will undoubtedly be made in many of the details of producing the serum, the method is believed to be now in such condition as to make the practical use of it entirely feasible.—(B. A. 1, 25th A. R.)

Duration of Immunity.—Experimental evidences warrant the statement that a hog once immunized to the disease of hog cholera will retain the protection for a period of several months. Thus the successfully vaccinated or immunized hog may be kept with no risk of infection for a period long enough to fatten and prepare the animal for market.—(Kan. B. 157.)

Transmission of Disease by Hogs Treated by Serum-Simultaneous Methods.—To test the possibility of disease being conveyed to normal hogs by hogs that had been vaccinated, 58 shoats were placed in the pens with the vaccinated hogs. Of these pen checks none became sick unless some of the vaccinated hogs with which they associated became severely ill; indeed in a number of instances the pen checks remained well, even though they associated with vaccinated hogs exhibiting undoubted symptoms of hog cholera. From this it appears that the immune serum not only possesses the power to protect hogs from a simultaneous injection of disease producing blood, but that even in cases where too little serum is given it yet has a marked tendency to lessen the infectiousness of the disease. Of the 58 pen checks exposed to vaccinated hogs, 6 contracted hog cholera and 5 died.

As a control experiment, 19 shoats were placed in the pens with the hogs that were injected with disease-producing blood alone. Of these, all became sick, 17 died, 1 was killed to secure blood for other experiments, and 1 recovered. In other words, of the pen checks exposed to hogs injected with disease-producing blood alone, 94 per cent died, whereas only 8 per cent of the checks exposed to vaccinated hogs succumbed.—(B. A. I. Cir. 102.)

Care Before Vaccinating.—Cut down the ration two or three days before vaccinating, feeding little corn. Keep the animals clean and in dry, comfortable quarters, and if possible in disinfected pens. If the weather is favorable, a dipping would be all right a few days before vaccinating.—(K. B. 163.)

Treatment After Vaccinating.—From the fact that there is always more or less fever caused by vaccinating and more or less danger of the animal becoming infected through the wound made by the needle of the syringe, the following after-treatment would suggest itself: Spare diet for three or four days, especially of corn, but plenty of water, thoroughly clean and comfortable pens with plenty of clean bedding, with absolutely no chance to get into mud of any kind. The more mud and dirt the more danger. They should not be dipped or operated upon for at least two weeks after vaccinating.—(Kan. Bul. 163.)

Conclusions on the Use of Cholera Serum.—Since these results were obtained the Department has brought this method of preventing hog cholera to the attention of the various State Experiment Stations and live stock sanitary boards throughout the country and has proposed to them that they take up this work and prepare a serum for the benefit of hog raisers, as the preparation of serum by the Federal Government on a large enough scale to supply the needs of the entire country seemed to be impracticable. As a result of this, a number of the States have taken up the work, and in practically all cases where a thorough test has been made they have confirmed the results obtained by the Department with this method. We therefore feel safe in saying that this process will prevent hog cholera, provided due care is given to the preparation of the serum and to its application. The serum preparation is of such a nature that it should not be undertaken by farmers themselves, but should be under the control of trained men who have had experience in bacteriology and who are also thoroughly familiar with the diseases which affect hogs.

Finally, it should be remembered that this serum is to be used especially as a preventive, and that little success can be expected in herds which are badly affected with hog cholera. An early application is essential, and in the States which have taken up this work the farmers should notify the proper authorities immediately upon their hogs becoming ill, so that they may be treated at once.

Inasmuch as the serum described herein is a comparatively new substance, it is not to be expected that success will always follow its use, but as it has been already definitely proved that hog cholera may be prevented with this serum, the failures, if they occur, will be caused by local conditions or variations in the details of serum production, which can be corrected. Those who are interested in the subject are urged to co-operate with the State authorities who have control of this work and to assist them in their efforts to produce a reliable serum. It is only through such intelligent co-operation that we can expect to attain the final result which is aimed at, namely, the eradication of hog cholera as a serious menace to the hog-raising industry in this country.

NOTE—The United States Department of Agriculture is not preparing anti-hog cholera serum for distribution. Those who wish to obtain serum should apply to their respective State veterinarians or agricultural colleges.—(F. B. 379.)

What to Do When Cholera Breaks Out.—Since the serum treatment has given such excellent results when intelligently used, the first step should be toward securing some serum. Write or wire at once to your State Experiment Station or Veterinary Department. Several states are now distributing the serum at cost. Inasmuch as the serum treatment is for well hogs, not sick ones, it is absolutely necessary to act without delay; and as the serum can be kept indefinitely in a cold place, it is good judgment to keep in close touch with your station, which will not only supply serum at cost *when available,* but otherwise direct the management of affected herds. Do not wait until your hogs are sick and some of them die; but fortify yourself against any loss as soon as the malady is reported in your neighborhood. When writing, supply the following information at once and save valuable time: 1. Number of animals on hand. 2. Approximate weight and age. 3. When did you first notice sickness (in days)? 4. Number of sick animals (give symptoms). 5. Number that have died. 6. Number still healthy. 7. What have you done since the outbreak? 8. Have you separated the well animals? 9. What are you feeding? How much? 10. Give names with addresses of other parties or neighbors whose herds are or have been infected with cholera in your vicinity.—(Suggested by N. J. L. S. C. Cir. 1.)

Hog cholera serum is a preventive of *hog cholera* only. It can not be expected to prevent hogs from dying or becoming sick from any other infection than that of *hog cholera* or from disorders caused by intestinal or other parasites. Hog cholera serum can not replace proper care and feeding of swine or save hogs from dietary troubles other than those caused by the *virus of hog cholera.*

Contract.—A contract is required of all using the serum, releasing the laboratory from all responsibility in the matter.

Cost of Serum.—A charge of *two cents* per cubic centimeter is made for the serum. This is below the *actual cost* of production and testing.—(Mich. Cir. 6.)

Experiment has proved that copper salts have no value as a preventive of hog cholera.—(Neb. 19th A. R.)

Plan for Eradicating Hog Cholera by Serum Immunization.—If the greatest good is to be accomplished we should not be content simply to reduce the losses from hog cholera, but should undertake systematic efforts to eradicate the disease. The course which hog cholera usually takes when it appears in a neighborhood is well known. A herd develops the disease, which may not be recognized as hog cholera for several weeks after it has made its appearance. Following this the neighbors' hogs become infected and the disease spreads rapidly, the number of new foci increasing more rapidly as the infected area widens, until finally the losses in a single county may be enormous.

It is evident that in order to control the disease there must be some means of confining it to the original center of infection. This has been attempted by the British Government through the quarantine of farms where hog cholera exists and the slaughter of all infected animals. That such procedures alone do not yield the desired results is shown by the official reports of the continued prevalence of hog cholera in England. In the United States such methods would not be suitable, for, aside from the enormous expense involved, it would, in my opinion, be entirely impracticable to thoroughly disinfect extensive farm premises and to carry out a quarantine which would be effective against such carriers of disease as dogs, crows, buzzards, and other animals.

It has already been stated that the serum from hyperimmunized hogs can be used to protect hogs from hog cholera and that a large saving can be effected if the serum is applied promptly after the disease appears in a herd. Why, then, should not this serum be used as an agent for the eradication of hog cholera? It seems reasonable to believe that it can be used successfully for this purpose, but complete success can not be expected without proper organization and the direction of the work by health authorities. In order that the possibilities of well-directed work along these lines may be brought to the attention of those who may in the future have this work to perform, the following plan for combating hog cholera through serum immunization is submitted:

1. The serum should be prepared by the State Experiment Stations or by State live-stock sanitary boards which are properly equipped with laboratory facilities, the efficacy of all serum to be determined by such laboratories before distribution.
2. The field application of the serum should be in the hands of the State live-stock sanitary board or State veterinarian.
3. The State should be organized into districts, each in charge of a deputy State veterinarian or a deputy appointed by the live-stock

sanitary board. These districts should be small enough to permit the deputy to exercise close watch over them.

4. The deputy State veterinarian should keep a supply of serum on hand, so that prompt action may be taken when infection appears.

5. Hog raisers generally throughout the State should be informed when the serum is available for distribution, and if necessary compulsory notification of the presence of disease in a herd should be imposed.

6. Upon notification to the State live-stock sanitary board or State veterinarian that hog cholera has appeared in a certain neighborhood, the diseased herd or herds should be immediately quarantined, the premises disinfected as thoroughly as possible, and all hogs on the farm which have been exposed or which are not visibly ill should be treated with serum alone. All hogs on the farm which have not been exposed should be treated by the simultaneous method, and of course the prompt removal of dead animals should be enforced. At the same time all hogs on surrounding farms should be treated by the simultaneous method.

Prompt action of this kind should result in confining the disease to the first herd where disease appeared, though we must admit the possibility of infection being carried beyond the vaccinated belt by birds. If this should occur, the procedure should be the same as in the first case of disease, though the probability of dissemination by birds will not be great, owing to the comparatively small size of the infected area. With a well-organized live-stock sanitary board and an efficient corps of deputies throughout the State, there seems to be no reason why hog cholera should not be kept well under control and perhaps in time eradicated by proceeding in the way indicated. By starting the work in early spring or summer the task would probably be much simplified and the cost reduced to a minimum.

Aside from the eradication of hog cholera, it seems that an important saving to swine breeders and to the hog industry in general can be accomplished through the protective inoculation of purebred hogs. Some of these hogs represent years of patient effort on the part of breeders, and their loss is a loss to the swine industry in general, which depends for its success in great measure upon the development and preservation of the superior characters possessed by these purebred animals. There is no doubt that the hog raisers would gladly co-operate with the State authorities and that as a rule any outbreak of disease would be promptly reported, as the farmer would have everything to gain and nothing to lose by so doing.—(B. A. I. 25th A. R.)

Other Means for Prevention of Hog Cholera.—All that is necessary to prevent hog cholera is to keep the germ of the disease away from the herd. It has been shown that in the vast majority of cases this germ is transported mechanically, in the bodies of sick hogs and on the feet of men or animals, including birds. It thus follows that the chance of an outbreak of hog cholera will be greatly lessened, if not completely avoided, if a herd is protected from these carriers of the infection. The enforcement of a complete quarantine is, however, not practicable under average farm conditions, and the best that can be hoped for is the lessening of the opportunity for infection by placing the herd on a part of the farm that will be the least accessible to men or animals from other farms. Hog lots should never be located near public roads if this can be avoided. All newly purchased stock should be kept separate from the main herd for at least thirty days.

In addition to protecting the herd by methods of quarantine, careful attention should be given to the general health of the herd. The hogs should be provided with clean, dry sleeping places, and the lots and feeding troughs should be kept clean. It is well occasionally to scatter slaked lime about the lots and to wash and disinfect the troughs. Probably the best disinfectant for this purpose is the compound solution of cresol (U. S. P.), which can be prepared at any drug store. One part of this should be mixed with 30 parts of water and the troughs scrubbed with it. The disinfectant is then washed out of the troughs with water.

After an outbreak of hog cholera the yards and pens should be thoroughly cleaned, all dead hogs should be burned or buried deep with quicklime, the litter should be collected and burned, and lime scattered freely over the ground. The sheds and hog houses should be washed thoroughly with the solution of cresol as above described before new stock is brought on the place. Feeding troughs that have been used by sick pigs should be burned if made of wood, but if this is not practicable they should be scrubbed clean and thoroughly soaked with the cresol solution, the latter being washed out before the troughs are used again.

It is possible to start an outbreak of hog cholera in a herd by bringing hogs on the farm that have had the disease and have apparently recovered. We have no definite information concerning the length of time that such hogs may be able to communicate the disease to others, but for safety's sake two or three months should be allowed to elapse after complete recovery before placing such an animal with susceptible pigs, and then only after washing or dipping in a disinfectant solution (compound solution of cresol, 1 to 100).

In Farmers' Bulletin 24, Dr. D. E. Salmon gave the following formula for a medicine used many years ago as a preventive and cure for hog cholera, and sometimes called "Government Hog Remedy":

	Pounds.
Wood charcoal	1
Sulphur	1
Sodium chlorid	2
Sodium bicarbonate	2
Sodium hyposulphite	2
Sodium sulphate	1
Antimony sulphid (black antimony)	1

Experience has shown, however, that this medicine is not to be regarded as a cure or preventive in the true sense of the words, but it is nevertheless a very good condition powder. This powder is mixed with the feed in the proportion of a large tablespoonful to each 200 pounds weight of hogs to be treated, and should not be given oftener than once a day. This medicine can not be relied upon to prevent the occurrence of disease, except in so far as it improves the general health of the hogs. Therefore, even though this remedy be used, strict attention must be given to quarantine and sanitary measures if the disease is to be warded off when in the neighborhood.—(F. B. 379.)

Again referring to the adage, "Prevention is better than cure," every means available should be used to prevent cholera from gaining access to the herd. Especial care should be exercised in the buying of animals with the assurance that they come from clean premises and all new animals should be isolated for two or three weeks so that if infected the disease may show itself before they are brought in contact with the remainder of the herd. Carcasses should be burned or buried deeply and covered with quick lime, while the pens should be thoroughly cleaned and disinfected by saturating with a solution of 5 per cent carbolic acid.

With these measures of prevention coupled with the control of the disease by the serum method, it is believed that this profitable branch of the live stock industry will in this State assume much larger proportions in the near future.—(S. C. B. 152.)

The feeding and the care of hogs have much to do with the prevention of the cholera. Clean, dry pens, regular and proper feeding, comfortable sleeping quarters, plenty of sunshine, the pens cleaned and disinfected regularly, the hogs themselves dipped every few weeks when the weather is fit, all help in keeping up their vitality, and in this way warding off troubles of all kinds. Many hog raisers feed at regular intervals some of the Government Hog Remedy to aid digestion and circulation and to prevent worms, especially where the animals are confined to a small lot.

After shipping a hog it should be dipped as soon as removed from the crate and kept away from all others for several weeks, and then dipped again before being allowed to come in contact with the rest. If a hog shows signs of sickness it should be at once removed and kept by itself until well.

In September, 1909, a breeder of high-class hogs, living several miles from the college, noticed three head sick, one almost dead. A *post-mortem* was held by members of the Veterinary Department of the college and the disease diagnosed as acute cholera. The remaining hogs were thoroughly dipped and removed to new, clean quarters and everything disinfected, and no further cases developed. Prompt, vigorous methods in this case saved the herd.—(Kan. E. S. B. 163.)

For the prevention of cholera and swine-plague the first and most essential thing is by every means possible to avoid infection from diseased hogs. The observations made during the past two years have shown that the principal ways in which these diseases get spread in this locality are all in some measure at least preventable. These are: Allowing hogs, both healthy and diseased, to escape from the farm where they belong and on to the public roads; infection conveyed by the drinking water polluted by dead and diseased animals further up the stream; the introduction of purchased hogs on to a farm without proper investigation as to the health of the herd from which they came. The first two of these causes of infection might be diminished greatly by common action of the community which is threatened by merely enforcing the laws which already exist on the statute book but which are now entirely disregarded. The third is, of course, entirely within the control of each individual concerned. —(Ark. B. 67.)

Management of Cholera Herds.—Immediately disinfect the premises thoroughly. Separate the well hogs from the sick ones, and divide the healthy animals in two or more groups, and isolate them as completely as is possible. All carcasses of hogs which have died from cholera should be burned or buried deeply and covered with quicklime. As the germs of cholera gain access to the system through feeding, the way of prevention is well marked. All feeding troughs and utensils should be thoroughly cleaned and fumigated, the yards plowed and preferably planted with a forage crop in season. Feed sparingly, using a laxative, easily digested and nourishing ration. When hog cholera serum is used, the hogs treated should remain together in the infected yards. The possible introduction of the disease into the pens by people, dogs, birds, etc., should be guarded against, especially if hog cholera is in the neighborhood. Whenever it is necessary for a person to enter a hog lot when the disease is present, the shoes should be thoroughly cleaned and disinfected. Persons taking care of diseased animals should take necessary measures to prevent the spread of the disease, and see that others take similar precautions.—(N. J.—L. S. C. Cir. 1.)

When several hogs die within a short time, it may be safely assumed that the cause is due either to hog cholera or swine plague, or both diseases at the same time, and the following instructions should be closely followed: Report the matter at once to the State Veterinarians; bury or burn at once all hogs which have died of any disease; confine the hogs to enclosures removed from the public highway; disinfect hog pens and enclosures by sprinkling with the following solution: Carbolic acid, crude, 1 lb. to five gallons of water, or air-slacked lime instead may be used daily; hogs should be kept in dry pens; dogs must be tied up, as they carry the disease; wagons or hog racks used to remove dead hogs must not be taken on a neighbor's farm; only the one whose duty it is to feed the animals should be allowed near the pens, this attendant to keep away from neighbors' hogs. As preventative measures when the disease exists in the neighborhood the following precautions should be observed: Do not visit your neighbors' hog pens or enclosures, nor allow any unauthorized person to go into your own hog pens or enclosures; keep your dog tied up; do not allow your hogs to run, but keep them in small dry pens or enclosures.—(N. D. B. 83.)

HOW TO DISINFECT.

There is no place on the farm where disinfectants are more useful than in hog houses or yards. Whitewash; air slacked lime; chloride of lime; stock dips; compounds of creosote; crude carbolic acid or other commercial disinfectants are commonly used. Pastures and hog lots may be improved by removing the hogs for a few weeks each year, and cleaning away all litter. The unused lots can be plowed and planted with a suitable forage crop. Precautions against contaminations of food and drinking water must be taken. Muddy yards soon become filthy and endanger the health of the animals. They should be well drained, and all wallow holes filled. It is poor practice to use pens and yards where drainage from other lots collects or puddles. The quarters where hog cholera has raged should be thoroughly cleaned; all walls, floors and troughs scraped, after which a good disinfectant should be applied with a brush or force spray pump. All litter should be removed and burned, the yards plowed and seeded, or where this is not practical, dry straw spread over the ground and burned will be effective. Crude oil applied with a body brush will effectually destroy lice and other external parasites. Repeat treatment in seven days until all are killed. The following solutions are recommended for disinfecting the premises:

Compound of Creosote..........	1 part to 30 parts water
Crude Carbolic Acid............	1 part to 30 parts water
Corrosive Sublimate............	1 part to 800 parts water

Troughs should never be permitted to get sour or filthy as is often the case when the animals are overfed and fail to eat all that is put before them. The feeding of corn on cement or wooden floors is positive economy, especially where the yards are small and often muddy. Dry roomy sleeping quarters are essential during the winter months, and shady runs in summer. Pastureless pigs are neither the most profitable, nor the most resistant to prevalent diseases.—(N. J.—L. S. C.—Cir. 1.)

All straw, cobs and litter should be removed and, if cholera is present, burned, and a strong solution of some good coal-tar dip or crude carbolic acid, about one part of the dip to twenty of water, used on all woodwork and floor of the pens; slaked lime scattered over the ground and floors of the pens every few days will help to keep them clean.—(Kan. B. 163.)

Diseases Which may be Mistaken for Hog Cholera.—Among the few diseases which may lead to uncertainty are digestive troubles (due to improper feeding), swine plague, tuberculosis, anthrax, and inflammation of the lungs caused by worms.

Although hogs are frequently made sick by improper feeding, there is rarely any cause of mistaking such illness for hog cholera, the only trouble of this character which is likely to give rise to confusion being in the case of swill-fed hogs. Dr. V. A. Moore has reported a disease among swill-fed hogs which closely resembled hog cholera and which was directly traceable to the presence of powdered soaps in the slops. Some of these soaps contain a large amount of alkali, and when mixed with the garbage used for feeding hogs will bring about lesions in the internal organs which are very similar to those seen in hog cholera. In most cases it will probably not be difficult to distinguish such a disease from hog cholera, especially if the mode of feeding be considered. If the illness is due to the presence of alkali in the swill, a change of food should result in a prompt improvement in the condition of the animals. If this does not occur, then, of course, hog cholera or some other germ disease should be at once suspected.—(F. B. 379.)

Some conditions or diseases which resemble cholera are tuberculosis, although this disease is usually much slower in its progress; ordinary digestive troubles, due to improper feeding or unsanitary surroundings; anthrax; pneumonia, caused by dust, cold or worms. Garbage which contains much soap, lye or salt will frequently cause death with symptoms resembling cholera. Moldy bread, cottonseed meal, new corn, or too sudden changes of feed. Many things which are unfit for human food are thrown into the swill barrel, to form toxins and ptomains. These may cause vomiting, bloody diarrhœa, griping, nervous troubles, weakness, staggering gait, dullness, and death, all of which are laid to cholera.—(Kan. E. S. B. 163.)

SWINE PLAGUE.

It is not practicable for a farmer to attempt to distinguish between hog cholera and swine plague, for, while swine plague is generally regarded as a lung affection, and hog cholera as a disease of the intestines, the fact is that practically all of the lesions which are found in cases of hog cholera have also been reported as being present in outbreaks of swine plague. There is at present a tendency on the part of those who have investigated these diseases to regard both hog cholera and swine plague as being caused by the same invisible germ, the predominance of lung lesions in one case and intestinal inflammation in the other being caused by the action of different germs which attack the hog after it has been made sick by the invisible germ which is looked upon as the prime cause of the disease in both cases. However this may be, it is quite safe to say that the great losses which occur among hogs in this country are brought about by hog cholera, and that, for the present at least, we may ignore the existence of swine plague as a separate disease, especially as the general measures for controlling it are the same as those required in cases of hog cholera.—(F. B. 379.)

These two diseases resemble each other, and as both are equally contagious, the same measures must be used in prevention and control.—(N. D. B. 83.)

FEDERAL REGULATIONS TO PREVENT THE SPREAD OF HOG CHOLERA AND SWINE PLAGUE.

Regulation 47. No swine which are diseased with hog cholera or swine plague, or which have been exposed to either of the diseases by contact with diseased animals or by confinement in infected cars, pens, or other premises, shall be transported, trailed, or driven from one State or Territory into another State or Territory or the District of Columbia, except as hereinafter provided. All persons intending to ship swine shall ascertain before offering them for shipment that the animals are not diseased and have not been exposed to the contagion of either disease.

Regulation 48. Swine which are not diseased with hog cholera or swine plague and which have not been exposed to the infection thereof may be shipped from one State or Territory or the District of Columbia without restriction by the regulations of the Secretary of Agriculture, and subject only to such restrictions as may be imposed on the shipment by State or Territorial or District of Columbia officers at destination.

Regulation 49. Public stock yards shall be considered infected and no swine shall be shipped therefrom for feeding or stocking purposes. No diseased swine shall be shipped from the stock yards, but shall be slaughtered, subject to condemnation on postmortem inspection; and all swine in a certain lot or shipment shall be considered diseased when one or more of them show evidence of the disease. Swine that are not diseased and have been merely exposed by being in the yards may be shipped to a recognized slaughtering center for immediate slaughter. Where, however, a part of the yard is set apart for the reception of uninfected shipments of swine and is kept free of infection, swine may be shipped from such part without restriction. Should such part be contaminated by the introduction of diseased swine, said animals shall be immediately removed therefrom, and the chutes, alleys, and pens occupied by them thoroughly cleaned and disinfected as hereinafter provided.

Regulation 50. Cars and other vehicles and pens or yards which have contained diseased or exposed swine shall be cleaned and disinfected as soon as possible after unloading. Cars shall not be removed before the inspector has had time to ascertain the condition of the animals and give notice that the cars must be cleaned and disinfected. Cleaning and disinfection shall be done by first removing all litter and manure and then saturating the interior surfaces of the cars and the woodwork, flooring, and ground of the chutes, alleys, and pens with a 5 per cent solution of 100 per cent carbolic acid in water, with sufficient lime to show where it has been applied.—(Ind. B. 113.)

TUBERCULOSIS.

Cause of Increasing Heavy Losses.—Tuberculosis in the human family has been lessening materially during the past fifteen years, but reports from the various meat-packing centers of the country fail to show the same encouraging condition regarding tuberculosis in hogs during the same space of time. It must be admitted that reports have come from several localities during the past four years showing a decrease in the number of tuberculosis swine sent to market, but a review of the collected records of the country at large shows an increase rather than a decrease in the number of swine affected. Indeed, there is probably no disease of hogs, not even excepting hog cholera, which is causing heavier losses to the hog raiser than tuberculosis, and it is also the cause of great loss to the packers and of much anxiety to the veterinary inspector of meats. Until recent years tuberculosis had been looked upon as of uncommon occurence, and only of importance from a meat-inspection standpoint; but today it must be considered as a general veterinary problem which should receive the careful attention of all sanitarians.

The swine of this country January 1, 1908, according to estimates of the Bureau of Statistics of the Department of Agriculture, numbered 56,084,000, and their value at that time was $339,030,000. From these figures one may partially realize the serious menace to the hog-raising industry which is offered by a disease which affects almost 1.5 per cent of all hogs slaughtered at the abattoirs of this country which have Federal inspection. Reports from European abattoirs show that tuberculosis is far more widespread among their hogs than among ours, some of the returns showing as high as 5.5 to 7.5 per cent. It is to be hoped that the spread of the disease in this country may be checked, and that concerted action by the stock owners and veterinarians may lead to the complete eradication of this costly affection.—(B. A. I. Cir. 144.)

Prevalence.—The prevalence of tuberculosis among swine must be judged by the abattoir statistics entirely. Thus it has been noted from the records kept by the Bureau of Animal Industry that some sections of the country contribute a greater proportion of diseased animals than others. Hogs from Arkansas, Oklahoma, and Texas are remarkably free from this disease, due probably to the method of caring for them, or rather the lack of caring for them. They are not hampered in feed lots as those are in the sections where the disease is mostly found, but are allowed to roam over large areas of pasture and to shift for themselves, and when they are found affected the majority of them show very slight lesions. Furthermore, no prolonged feeding is practiced in narrow bounds as in the corn belt. Lastly, there are relatively few dairies in these sections, and likewise few tuberculosis cattle. On the other hand, the hogs are carried from birth to maturity on some form of pasture, as alfalfa, oats, corn, cowpeas, sorghum, rape, and peanuts all the year round. Swine fed on entirely vegetable food, as corn and roughage, are proportionately less affected than those fed on dairy products or behind diseased cattle.

Three cities in one of the leading dairy States show 3.1 per cent, 3.4 per cent, and 6.4 per cent, respectively, of the hogs slaughtered to be affected with tuberculosis. There are a large number of co-operative creameries in the territory contiguous to the three cities alluded to and the raw skimmed milk is taken home by the patrons for their hogs.

The hog buyers for packing houses are from bitter experience gradually becoming familiar with these conditions and are avoiding certain sections of certain States, and there are at least two eastern packers who will not under any condition kill hogs from one of the badly infected States. In other localities the packers are beginning to take self-protective measures so as to have the feeder of diseased hogs bear the burden, and many of the smaller establishments in the Central West are buying hogs subject to post-mortem inspection. This attack on the farmer's purse will probably have more beneficial results in making him fully alive to the seriousness of the situation than any other procedure.

In an endeavor to trace the origin of the infection of tuberculosis hogs that were arriving at one of the packing plants of Iowa, Rogers of the Bureau of Animal Industry for some time carried on an experiment which consisted in tagging the hogs that were hauled to market at that place in wagons, before they were removed from the farmers' wagons, and later using these tags as means of identification in case tuberculosis was found to exist in any of the hogs at the time of slaughter. In this manner 3,420 hogs were tagged, and on tracing them to their final disposal it was learned that all of the tuberculosis live stock brought to that market came from a few farms—less than 6 per cent of the total, while the remaining 94 per cent of the farms were free from the disease. This proportion of noninfected farms should give great encouragement to any efforts that may be made to eradicate the disease from the State. It was further noted that the successive shipments of hogs marketed by certain farmers always contained tuberculosis animals, and in at least two instances the entire consignments were condemned for tuberculosis at the time of slaughter.—(B. A. I. Cir. 144.)

Methods of Infection.—As a result of numerous experiments conducted on hogs it has been quite conclusively shown that hog tuberculosis is an ingested disease and that the tubercle bacilli are absorbed almost at the beginning of the alimentary canal.

In a certain small number of cases infection probably occurs directly through the respiratory tract, but these instances are extremely rare. Even more infrequent are those cases of tuberculosis which arise as a result of traumatism, especially the infection of castration wounds by the use of infected instruments or otherwise. One boar has come under our observation whose testicles and mucous membrane of the penis were so markedly tuberculous that the genital tract of the sows covered by him could scarcely have escaped infection.

The most frequent infection of hogs with tuberculosis, as has just been pointed out, occurs, no doubt, through the digestive tract, and in this mode of infection tuberculosis of cattle is very intimately concerned. In those instances in which a marked increase in the number of tuberculous hogs from a certain locality has been noticed and investigated it has too frequently been found that the hogs in question had been fed upon the by-products of a cream separator or that the carcass of some animal succumbing to tuberculosis had been thrown to them for final disposal. The certainty with which either of these two conditions will lead to the infection of the hogs has not heretofore been appreciated in many quarters.

Another source of infection for swine has been shown to exist in the practice of allowing them to run behind a herd of cattle, where the tubercle bacilli excreted with the feces by a tuberculous bovine may readily infect the hogs. Infection of a litter of pigs by a tuberculous sow presents another source of danger. There are a number of other methods of infection which will be mentioned later, but they should be considered of minor importance and must not detract attention from the leading factors in the production of the vast majority of cases of hog tuberculosis, which are unquestionably the milk and feces of tuberculous cattle. When once these are controlled tuberculosis of swine will forthwith be greatly reduced.—(B. A. I. Cir. 188.)

Infection from Cattle through Milk and Feces.—We judge from experiments made, in which hogs were fed large quantities of milk from tuberculous cows, that of the two methods—the exposure of hogs to the feces or to the milk of tuberculous cattle—the former has by far the greater danger, entirely apart from the fact that exposure to the feces, in the manner in which it occurs, is never a simple exposure to one thing, but a general exposure to all the infectious material that may pass from cattle irrespective of whether they are milk-producing animals or not.

Beef cattle behind which hogs are turned are usually young animals, and the percentage of tuberculosis among them, and more especially generalized or advanced tuberculosis, is very low. Dairy cattle, the average age of which is greater, show a much higher percentage of disease, and for this reason hogs associated with them will probably contract tuberculosis more frequently. This greater frequency must not be attributed entirely to the milk the hogs receive from the cows. No farmer and no dairyman who is acquainted with the value of the undigested grain or other nutriment in cattle feces as a food for hogs fails to feed as much of it as he possibly can. At the Experiment Station of the Bureau of Animal Industry several lots of hogs were kept, for experimental purposes, under identically the same conditions with the exception that some, in addition to their other feed, received a few shovelfulls of cow feces daily, and some a small quantity of milk. The results showed conclusively that either feces or milk caused an improvement in the condition of the hogs greatly in excess of what can be accounted for by the actual nutriment contained in the feces or milk. The feces when given with the ordinary feed produced results fully as good as the milk. Of three lots of hogs, all of which received the maximum amount of mill feed they could be made to eat, one lot was fed a small quantity of milk daily, and one the nutriment contained in a small quantity of cow feces. At the end of three months the hogs that received either milk or feces were in equally good condition, and had made a gain in weight of from 75 to 100 per cent greater than that made by the lot of hogs fed purely on mill feed.

It is a question whether the tuberculosis that occurs among hogs associated with dairy establishments is not more directly traceable to the feces of tuberculous cows than to skim milk. Tuberculosis cows with unaffected udders rarely secrete milk infected with tubercle bacilli. The danger that milk may become infected from the environment of tuberculous cattle is probably greater than through the milk-secreting structures of tuberculous cows with healthy udders, and hence no tuberculous animals should be allowed to remain among dairy cattle or in dairy herds.

The feces of tuberculous cattle are a menace to hogs even when not deliberately fed to them. Very few establishments that keep both hogs and cattle make provisions effectually to prevent the access of the former to the manure heap on which the droppings of the latter are thrown. No farmer or stockman intentionally practices a system of feeding that is lacking in economy, and to know the benefits that are derived by hogs from the manure heap of stables containing heavily grain-fed dairy or beef cattle immediately causes its location in the hog yard. This practice is not harmful when the cattle are healthy; but when they are affected with tuberculosis it means, in the light of evidence we now have, an almost certain transference of the disease to the hogs.—(B. A. I. B. 88.)

Only recently a probable instance of infection of hogs by cattle feces came under observation. Of 34 hogs which were marketed in one lot 23 were found diseased, and upon investigation it was ascertained that the owner had a herd of dairy cows, the stable manure from which was thrown into the hog yard. The hogs were given no milk, nor were they permitted to mingle with the cattle, but were pastured and fed on corn and what they could gather from the cow manure. In fact, the latter form of exposure was the only plausible explanation of infection, and this was later accepted when the tuberculin test of the herd revealed 19 out of the 27 cows diseased, which test was confirmed when the cattle were slaughtered and found to be tuberculous, some in an advanced stage.—(B. A. I. Cir. 144.)

Pigs confined in small dry yards are no more susceptible to tubercle bacilli taken in the food than are pigs on pasture, while at the same time they are fully as resistant as are pasture fed pigs to tubercle bacilli from other sources. In tuberculous swine, tubercle bacilli of the typus bovinus are almost without exception the only ones found in the disease centers. Tuberculosis of swine has its principal origin in the tuberculosis of cattle and in the second place in the transference of tuberculosis from one hog to another. Nor is it impossible for the tuberculosis of other domestic mammals and of fowls to be transferred to swine. The tuberculous human being can give tuberculosis to swine, no matter what be the origin of his own disease. As a source of infection, the excretions and the flesh of diseased mammals in which living tubercle bacilli are contained come chiefly under consideration. The greatest danger comes from feeding swine with the separator refuse from the dairies. The tuberculosis of the other domestic mammals is to be traced back in most cases to the tuberculosis of cattle. It is to be expected that the repression of the tuberculosis of cattle will lead to a decrease of the tuberculosis of swine and the other domestic mammals.—(Iowa B. 92.)

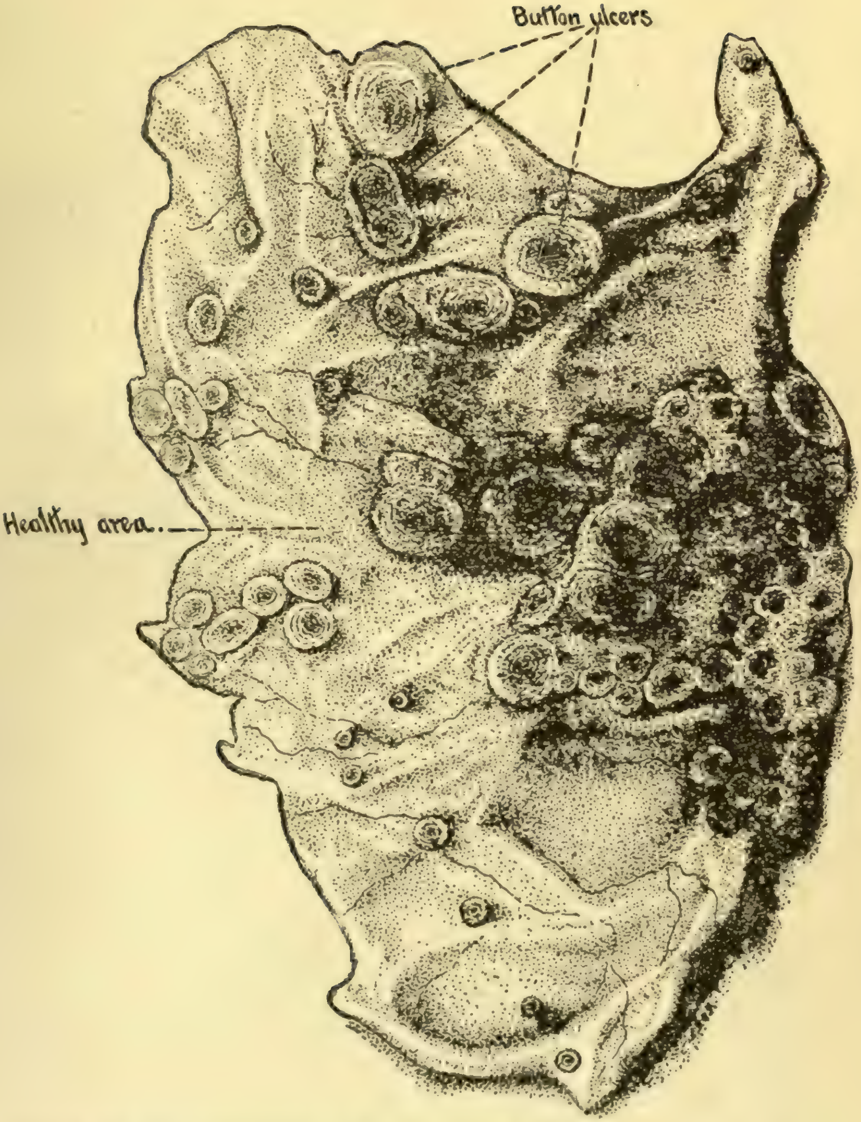
The one great advantage from a hygienic standpoint which the hand separator has over the public creamery is that the milk from an infected herd is usually fed to the one lot of hogs, while the skimmed milk from the creamery is generally all mixed together in a vat and each farmer takes back with him his pro rata of skimmed milk, which is most likely to be produced by several herds of other people's cattle. Hence the skimmed milk of but one tuberculous herd is liable, as a result of this practice, to contaminate the entire product of the vat into which it is placed. For this reason it behooves hog raisers to see that their skimmed milk has been properly heated before they feed it, and the State authorities to make such heating by creameries compulsory as a simple and easy way of greatly reducing hog tuberculosis.—(B. A. I. Cir. 144.)

Infection Through Carcasses.—It is an all too prevalent custom in some sections for hog raisers to buy up all carcasses of animals that have died from various unknown causes and feed them to their hogs. This is a fertile source of infection with parasites and with whatever infectious disease the animal may perchance have died. Several instances of tuberculous hogs being traced to such an exposure have been found. A prominent example occurred in an eastern abattoir where 31 out of 40 hogs were condemned for tuberculosis. When these animals were traced back to the raiser it was found that he was running a large dairy and that a dairy inspector had by clinical examination condemned one of his cows for advanced tuberculosis. In order to save something, as the owner stated, from the carcass, he hauled it out to the hog pasture and allowed the hogs to consume it, with the above disastrous results. Hogs that had been previously raised by him had never been condemned, and the lot in question were running on a large pasture, separated from cattle, and apparently had no other opportunity to become infected than by the condemned tuberculous dairy cow.

An equally dangerous source of infection is likewise observed in the methods which obtain among some of the small country slaughterhouses. It is not unusual for these houses to get rid of their blood, intestines, viscera, and other inedible parts by feeding them to hogs, a herd of which is usually kept on the premises. This custom is pregnant with danger and is another fertile source for perpetuating the infectious principle of various infectious and parasitic diseases.—(B. A. I. B. 144.)

Hogs readily contract tuberculosis through the ingestion of infected food. The feces of cattle that swallow tubercle bacilli are highly infectious for hogs that are exposed to them. The feces of tuberculous cattle very probably contain numerous tubercle bacilli that reach the intestine through swallowing or otherwise.—(B. A. I. B. 88.)

Infection by Tuberculous Attendants.—Attendants and caretakers who feed and care for hogs should be free from tuberculosis, since hogs are susceptible to human tuberculosis. Bang records the appearance of tuberculosis among hogs on a farm where this dis-



Portion of Large Intestine of Hog, Showing Button-like Ulcers Caused by Cholera. F. B. 379.

ease had never been seen before, which resulted from tuberculous attendants who were in the habit of spitting in the hogs' feed and about the premises.—(B. A. I. B. 144.)

Hogs are very susceptible to tuberculosis and may be easily infected by tubercle germs of either human or bovine origin. According to experiments conducted by Dinwiddie, hogs are more easily infected by germs of human origin than are any other domestic animal, while all of the species of domestic animals usually experimented on are easily infected by tubercle germs obtained from cattle.—(Okla. B. 63.)

Symptoms.—The distinguishing features between hog cholera and tuberculosis are that in the case of tuberculosis the onset of the disease is slow rather than sudden, as is the case in hog cholera; likewise the progress of the disease is very slow, and the symptoms exhibited by the hogs which are affected are those of general unthriftiness rather than of acute illness. Tuberculosis does not show a tendency to spread rapidly through a herd of hogs, as is the case in hog cholera, and the deaths, if any occur, will in the vast majority of cases follow a very prolonged illness. It is extremely rare that an apparently healthy hog will die quickly from tuberculosis. It is possible, of course, for a whole herd to show signs of tuberculosis at about the same period, because of having previously contracted the disease from the same source and at the same time, as, for instance, through the feeding of tuberculous skim milk. But in this case the hogs have caught the infection from the skim milk, and not from each other.

In cases of tuberculosis the post-mortem changes which may be found in the organs consist of whitish or grayish consolidated areas in the lungs, with sometimes a yellowish cheesy-like center. Similar areas, though not so large, are found in the liver, and in the case of the spleen we find nodules of varying size, some as large as an acorn. These nodules project above the surface of the spleen. They are whitish looking, and when cut are found to be of a tough, fibrous nature, the appearance of this organ being entirely different from that found in hog cholera. In tuberculosis the bloody points in the kidneys are absent, but ulcerations may be found in the intestines. These are usually in the small intestine rather than in the large intestine, and instead of being round and raised and button like, as in hog cholera, they are rather irregular in outline and depressed below the surface of the surrounding healthy tissue, indicating a destruction or eating away of the inner lining of the intestines.

Tuberculosis frequently affects the lymphatic glands, but the changes which this disease causes can hardly be mistaken for lesions of hog cholera, for in tuberculosis the inner portion of the gland is broken down to a yellowish, cheesy mass which is not at all like the lesions of hog cholera.—(F. B. 379.)

Tuberculous growths may be found attacking lymph glands in widely separated parts of the body. Indeed, a most extensive development of the disease has been reported in pigs from 8 to

10 weeks old, born of healthy parents and evidently infected by tuberculous skim milk. In these cases the lesions had not only undergone extensive caseous degeneration, but had even become partially calcified. As soon as the tubercle bacillus invades the tissue changes develop, resulting in the formation of nodules or tubercles which may be either translucent or of a yellowish-white color. At first these tubercles are isolated and discrete, but later they may coalesce and form large areas of tuberculous tissue.—(B. A. I. Cir. 144.)

In the great majority of cases of tuberculosis in animals the symptoms are slight and not at all clear in their indications. As the functions of the body must be disturbed more or less before any symptoms are apparent, it is plain that in the earliest stages of the disease there are no symptoms, and that when symptoms develop the disease is already considerably advanced. It is only when the affected part is located where it may be easily examined that symptoms are shown by which the infection may be detected at a comparatively early stage. Thus when the udder or the glands of the neck are the seat of tuberculosis the existence of the trouble is more likely to be revealed than when the affected organ is within one of the body cavities.

Although there is a great tendency for tuberculosis to spread to different parts of the body in swine, causing it to become more frequently generalized with these animals than with cattle, the rapidity with which they take on fat apparently enables them to resist the destructive influence of the disease, at least to the age at which they are generally slaughtered. Animals which come to market fat and appear perfectly well just before slaughter may be found quite seriously diseased.

In some cases, however, swine may show enlargement of the glands of the neck and of other parts of the body, diarrhea, emaciation, and tubercular inflammation and swelling of one or more joints. When the nutrition of the body is affected, as shown by loss of flesh, the disease usually runs a rapid course and causes the death of the animal in a few weeks.—(B. A. I. B. 38.)

Few hogs ever show by outward symptoms that they are affected with tuberculosis. In fact, the hogs that disclose tuberculosis at the time of slaughter are frequently the finest appearing animals in the drove when they are brought to the abattoir. Should indications of tuberculosis be present they will usually consist of a general appearance of unthriftiness, which might result from other diseases and therefore does not afford any very definite indication that tuberculosis is present.

Where the disease has progressed to an advanced stage of generalization various symptoms may appear. Abdominal tuberculosis is frequently accompanied by general disturbance of the digestive functions, and constipation or diarrhea may be shown. Advanced pulmonary tuberculosis will be shown by a persistent dry, harsh cough, and by acceleration in breathing, especially on exercise. This cough is similar to that caused by lungworms and can not be differentiated from it. Interference with both respiratory and digestive functions may be seen when the disease is widely generalized, and the systematic alterations will be shown by progressive emaciation and weakness. Localization of the disease in bones or joints may produce lameness and other visible indications, but these are comparatively very rare.

In the majority of cases no intimation of the presence of the disease will be given until the animal is slaughtered, and the discovery of a number of tuberculous hogs in a drove of apparently prime, well-finished animals is often the cause of great surprise and disappointment to their owner, and in such cases the lesions may be sufficient to prove the disease generalized and the tubercle bacilli to be so widely distributed as to render the meat unfit for food purposes.—(B. A. I. Cir. 144.)

The Tuberculin Test.—In those cases where the disease is not characterized by prominent symptoms, but where the animals are suspected of having the disease, the tuberculin test is recommended. This makes it possible to slaughter the reacting animals in the early stages of the disease and thus obtain some remuneration for the carcasses and at the same time get rid of the infection. This is especially important in holding over brood sows, as our experiments have indicated that the milk of these sows may contain tubercle bacilli and thus infect the young pigs.

In reviewing the questions of detection and eradication of tuberculosis in hogs it is noticeable at once that there are but few recorded instances in which any reliable tuberculin tests have been made. This may be due to the fact that the temperature of a hog is subject to rapid changes under conditions which would not cause noticeable variations with cattle. These alterations of temperature in individual hogs are so great within short spaces of time, and from such apparently insignificant causes, that it seems at first thought that no change caused by the injection of tuberculin could ever be sufficient to permit one to reach any definite conclusion as to the presence or absence of tuberculosis.

In the experiments of Schroeder and Mohler, of the Bureau of Animal Industry, recorded in Bulletin 88, it was found desirable to keep the hogs as quiet as possible during the test, it having been shown that excitement affects the temperatures of hogs very quickly. Each hog was therefore placed in a rectangular crate about twelve hours before the first temperature was taken, and remained in this confinement continuously until the tuberculin test was completed. The crates, while large enough to permit the hogs to get up and down easily, were still close enough to prevent their turning around or moving backward and forward to such an extent as to interfere with the insertion of the thermometers. Crates that are made 4 feet long, 1 foot 2 inches wide, and 2 feet high, inside measurement, have proven entirely satisfactory in restraining hogs weighing from 50 to 150 pounds. Unless use is made of crates, or of some other satisfactory means of restraint, it is difficult, if not impossible, to obtain trustworthy temperatures of hogs.

The dose of tuberculin used was estimated on a basis of ½ c. c. for each hundredweight, or fraction thereof, of the weight of the animals tested. For instance, a pig weighing 75 to 100 pounds would receive ½ c. c. of tuberculin, while one weighing 150 to 200 pounds would receive 1 c. c. The injections were made directly under the skin at the inner surface of the thigh, and in no instance were any harmful results noted following the puncture.

For a practical tuberculin test it has been found sufficient to have the temperature of the hogs taken every two hours from 8 a. m. to 6 p. m., inclusive, on the day of injection, and at the same hours on the day following, with the tuberculin injection made at 10 p. m. on the first day. The temperature before injection should be taken as frequently as after injection, and at corresponding hours, because of the very erratic character of the temperature of hogs and because of the slight circumstances that may inadvertently be the cause of marked variations. It should especially be borne in mind that the value of the results obtained depends entirely upon keeping the hogs absolutely quiet during the whole of the test, and this point may be more readily gained if the animals are kept in their crates for twelve hours at least before the first temperature is taken.

In reaching a decision as to the presence of tuberculosis in a hog, as shown by the temperature readings, it is somewhat unsafe to base a condemnation upon the comparison of the maximum reading before injection with the maximum of the day following, but by averaging the temperatures for each of the two days during which they have been taken one is enabled to reach very satisfactory conclusions by comparing these averages. It is essential that the temperatures should be taken at corresponding hours on each day of the test, if results are to be determined by means of averages. By this method it was found in a test experiment with 68 hogs that only two failures (less than 3 per cent) occurred. In these tests no hog was condemned as tuberculous until it had shown a persistent average elevation of temperature of 1° F. throughout the second day. In the two failures mentioned one tuberculous hog failed to react, and another animal gave a reaction, but at postmortem examination no tubercular lesions could be found.

A report has been received from Doctor Luckey, State veterinarian of Missouri, which shows that hogs may be tested satisfactorily and to good advantage with tuberculin if handled quietly and kept so closely confined that no chasing or driving will be necessary at the time of taking temperatures.

As a proof that carefully bred pedigreed swine are not necessarily more susceptible to tuberculosis than the more common varieties, mention is made in the Veterinary Journal of the testing with tuberculin of a number of purebred animals intended for export to Finland. The temperature of each pig, which was numbered for identification, was carefully taken, the average for the boars being 39° C., and for the sows 39.16° C., the higher temperatures of the sows being thought to be due to excitement, owing to their racing about when let out of their pen. The temperatures of all of the pigs were higher at the preliminary reading than at subsequent testings, probably the result of being caught and handled.

The tuberculin was injected at 10 p. m., and the temperature of each pig was taken at 7 o'clock the following morning and each two hours afterwards until the veterinarian of the purchasing party was convinced that no trace of tuberculosis existed in any of the animals. The variations in the temperatures of the various pigs were comparatively slight, that of one boar being from 39.2° to 38.5° C., and of one sow from 39.4° to 38.5° C., the highest being in each case the one taken first. The average temperature of all the pigs at the various testings was 38.6425° C., or nearly 0.3° C. less than those first taken.—(B. A. I. Cir. 144.)

Tuberculin is a product of the growth of the tubercle bacillus. It is prepared by sterilizing, filtering, and concentrating the liquids in which the tubercle bacillus has been allowed to multiply in the laboratory. This substance was first made and studied by Koch, and it was found that when injected into the tissues of a tuberculous animal it had the effect of causing a decided rise of temperature, while it had no such effect upon animals free from tuberculosis. The value of tuberculin for revealing the existence of tuberculosis was tested by many investigators during the years 1890 and 1891. The injection of this new drug was at once recognized as a most remarkable and accurate method for the detection of tuberculosis, even in the early stages and while the animal appeared to be in perfect health. Our knowledge of the tuberculin test was built up through the most careful and thorough scientific experimentation and should be accepted as entirely reliable. In practice the tuberculin test is conducted by first taking the temperature of the animal to be tested, at intervals of about two hours, a sufficient number of times to establish the normal temperature of the body under the ordinary conditions of life. The proper dose of tuberculin is then injected under the skin with a hypodermic syringe.—(B. A. I. B. 38.)

Before entering upon a discussion of the tuberculin tests it is desirable to say a few words about the temperature of hogs generally. The normal variations that occur in individual hogs are very great, so great, indeed, within short periods of time, and from apparently inadequate and frequently undiscoverable causes, that it seems at first that they are wholly incompatible with the successful application of a test which depends, for the information that can be derived from it, on a reasonable constancy of the temperature in the absence, and an increase of the temperature in the presence, of a specific disease. In addition to this variation in the individual animal, when the temperature of a number of hogs is compared the difference found is of such magnitude that we are at a loss to conclude what should be regarded as normal.

The hog is an animal that is ordinarily incased in a thick layer of fat, which is a poor conductor of heat and in which the circulation of blood is very meager. Over the fat a skin is stretched in which the circulation of the blood is relatively small, and this skin, unlike that of a man or a horse, does not take a prominent part in regulating the bodily temperature through the agency of radiation and perspiration. The covering of a hog may be regarded rather as an excellent means for preventing the escape of heat from, than for regulating the temperature of, the body; hence we have conditions that probably permit of a more rapid production than escape of heat. If we bear this in mind we see how urgently necessary it is that hogs should be kept very quiet for some time before and throughout the duration of a tuberculin (temperature) test.

Normally it seems that fat hogs have a higher temperature than lean ones, and that a higher temperature induced by exercise or some other temporary cause persists longer in fat than in lean hogs. These general remarks are based on numerous observations of hog temperatures made in the course of the last ten years on other hogs than those included in the tuberculin tests presented in this article.

In these experiments each hog was placed in a rectangular crate about twelve hours before the first temperature was taken, and remained in this confinement continuously until the tuberculin test was completed. The reason for confining the hogs during the tuberculin test was to keep them as quiet as possible, and to prevent increases of temperature incident to physical exertion and nervous excitement. The crates were large enough to permit the hogs to get up and down easily, narrow enough to keep them from turning around, and short enough to prevent too much movement backward and forward. The dimensions found to be satisfactory for hogs ranging in weight from 50 to 150 pounds are (interior measurement): Length, 4 feet; width, 1 foot 2 inches; height, 2 feet.

In the forward end of each crate a small trough for feeding and watering was fastened securely to the floor. The tops of the crates were fastened at the forward or head ends with hinges and at the rear with hasps and staples. At first an attempt was made to have a door at the rear end of each crate, to let down when the attendant was required to approach the hog to insert the thermometer into its rectum; but this arrangement was abandoned because it was found to be much easier to reach the hog from above. the material used in the construction of the crates was miscellaneous pieces of rough lumber 1 inch thick, wire nails, hinges, hasps, and staples. The only tools required were a hatchet and a saw. Without the use of crates of the kind described, or some equally satisfactory means of restraint, it is difficult, if not impossible, to obtain reliable temperature records of hogs.

The extreme need of quiet is very well illustrated by the temperature of 17 hogs, taken at noon on one day after they had been confined eighteen hours in crates such as have been described, and at noon on another day when it was necessary to catch and hold them in pens 12 feet long by 4 feet wide. In the crates the average temperature was found to be 102.3° F., and in the pens 103.1° F., a difference of 0.8 degree, and this notwithstanding that the pens were very small and the hogs could be caught and held without exercising or exciting them very much.—(B. A. I. B. 88.)

Among the 58 hogs tested, 26 were found on postmortem examination to be affected with tuberculosis. From the temperature records of the affected animals we obtain the following facts: After an injection with tuberculin the number of hours that pass before a reaction begins varies considerably, and the same is true about the time when the reaction reaches its maximum, and the number of hours during which the reaction persists. The average time when the temperature first rises above the maximum temperature before injection, and when the reaction reaches its maximum are, respectively, the seventh and the fourteenth hours after injection; and the average number of hours during which the reaction persists and the temperature remains higher than the highest temperature recorded before injection is twenty-three. If we divide the time of the reaction into two periods, one from its beginning to its maximum and the other from its maximum to its termination, we find that on an average the latter period is about twice as long as the former. The application of the tuberculin test to hogs is practicable, and the results obtained are as reliable as with cattle, provided the hogs are kept very quiet beginning some time before and throughout the entire test. The need for quiet can not be too much emphasized.—(B. A. I. B. 88.)

Preventive Measures.—The first step to be taken in preventing the further spread of tuberculosis is to remove all affected animals, whether hogs or cattle, from the premises, as these will only serve as sources of infection so long as they are allowed to mingle with healthy animals. In dealing with affected herds of cattle it has been found best in most cases to apply the tuberculin test to the entire herd as a means of selecting the tuberculous animals, but with a drove of hogs in which tuberculosis has appeared there can be no doubt that the best and surest method of procedure will in nearly every case be found in the slaughter of the entire drove as soon as they can be put in a marketable condition. They should be slaughtered at an abattoir under Federal inspection, so that proper disposal may be made of affected carcasses.

This means of removing from the farm all of the centers of infection which exist among its swine is made possible and practicable by the ease with which a new drove may be built up from fresh foundation stock. With cattle the offspring seldom number more than one to a cow in a year, and the young cow does not produce until 2 years of age. With swine reproduction may be expected when the young sow is 1 year old, and instead of producing but one at a birth from six to ten may reasonably be expected. If properly handled, the first litter of young may be weaned in time to allow the sow to farrow again the same year. This shows how very rapidly a farm may be stocked with healthy swine after the total slaughter of a tuberculous lot. The early age at which the sow may be bred, her capacity for breeding twice a year, and the plural number of her offspring are forceful arguments for the total destruction of every diseased drove of hogs and the breeding up in clean, healthy quarters of a sound healthy drove in its stead.

As tuberculosis seldom attacks the swine of a farm except through tuberculous cattle, the tuberculin test should be applied to all of the cattle on the place and all tuberculous animals among them should be destroyed at the time of disposing of the hogs.—(B. A. I. Cir. 144.)

Disinfection.—With the hogs all removed from the place and no tuberculous cattle remaining, attention should next be given to disinfecting the premises, so that no center of infection may be left to contaminate future purchases of live stock. The disinfection of pens and stables may be accomplished by thoroughly cleaning them, scrubbing the floors with hot water, brushing down all loose dust from the walls, and tearing out all woodwork which has become partly decayed. The interior of the pens or stables should then be carefully covered with a coating of lime wash containing 1 part of formalin to 30 parts of the lime wash, or 4 ounces of formalin to each gallon of the lime preparation. The yards should be carefully cleaned at the same time, especial attention being given to the removal of all rubbish and litter from the dark, shady corners. Lime, or a 3 per cent solution of carbolic acid, may then be sprinkled upon these dark portions of the yards. In all of the open portions of the yard the action of the direct rays of the sun will very quickly destroy all the virulence of the scattered tubercle bacilli.

The premises now being cleansed, healthy foundation stock may be procured, and if proper attention is given to keeping the cattle of the farm free from tuberculosis and to supplying the hogs with suitable food, the owner may feel every reasonable assurance that he has seen the last of tuberculosis among his swine. The trouble, time, and expense required will be more than repaid by the advantages gained. It has been quite conclusively shown that swine acquire their infective tuberculous material from cattle, mankind, or poultry, but principally cattle.

Tuberculosis can not develop spontaneously in swine, but must be acquired from some outside source, and the farmer whose yards and stables have been thoroughly freed from the disease need fear no reappearance of the disease, except when introduced from some outside point of infection. In case the disease has only recently been introduced among the hogs it would be advisable to apply the tuberculin test that the affection may be detected in the early stages, in order that the hog raiser may clean up his herd with as little loss as possible.—(B. A. I. Cir. 144.)

Pasteurization of Milk for Feed.—The heating of all milk when received at public creameries to 176° F., or 80° C., has been found most effective in preventing the spread of tuberculosis to the animals consuming the by-products of such creameries. Denmark was one of the pioneers in this movement, having in 1898 passed a law requiring all skimmed milk and all buttermilk to be warmed to 185° F. before it could be distributed from any creamery to its patrons for feeding purposes. It was found, however, that this degree of heat was harmful to the product, and in 1904 the required temperature was reduced to 176° F., experiments having proved that no tubercle bacilli could withstand this amount of heat.—(B. A. I. Cir. 144.)

Propaganda Among Farmers and Dairymen.—While pamphlets, popular articles, and public notices would be extremely useful in eradicating tuberculosis in swine, it would probably be more satisfactory to explain to the hog raiser by word of mouth the methods to be followed. As this suppression of tuberculosis is entirely voluntary on his part, a powerful propaganda is of the greatest value, and the veterinarian is the best equipped man available for the work. The State should also assist by employing veterinarians to give public lectures in towns and townships, as is being done at present in Sweden. We now have absolute knowledge that the vast majority of cases of hog tuberculosis are produced by (1) Raw milk and slime from creameries; (2) Hand-separated milk from tuberculous cattle; (3) Feeding behind tuberculous cattle; (4) Feeding tuberculous carcasses; (5) Feeding slaughterhouse offal.

It therefore behooves veterinarians to educate their clients as to the proper methods of preventing this disease, as they would recommend a proper feeding ration or proper construction of a stable. Hog raisers should be instructed to (1) scald all raw products returned from the creamery; (2) to test their cattle if a hand separator is used on the farm, or in the absence of such a test, to scald the skimmed milk; (3) to let the hogs feed behind cattle only when the latter have withstood the tuberculin test; (4) to feed carcasses of animals that have died from any cause, or offal from the slaughterhouse, only after the meat and offal have been thoroughly cooked.

Sooner or later the packer and slaughterer are going to buy hogs subject to the post-mortem inspection, as they are at present doing in some of the large packing centers with certain classes of female cattle; and the hog raiser who continues to fatten his hogs with tuberculous material should be made to sustain the losses arising from his lack of knowledge, skepticism, or indifference. The innocent purchaser, who can not be familiar with the methods of feeding in vogue on the farms of the different breeders, should not be expected to bear such losses, nor should the intelligent hog raiser who produces healthy hogs by carrying out minutely the known and proved methods of prevention be obliged to bear a portion of the burden caused by the careless or ignorant hog raiser, as is the case at present. Today the hog buyer must make his purchases with the absolute knowledge that a certain proportion of his purchase will be condemned for tuberculosis, and as the post-mortem examination is the only key to the extent of the disease, the careful breeder must suffer equally with the careless one. This is not equitable. When the packer buys subject to the post-mortem results the intelligent hog raiser will get more for his healthy hogs than he does now, and the ignorant breeder will get less for his tuberculous hogs, which is as it should be.

It would be money well expended if butchers and packers who are losing so much from hog tuberculosis would employ veterinarians in their vicinity to write popular articles giving correct views on how to suppress tuberculosis on the farm and mail them to their hog shippers and hog raisers in furtherance of this plan of eradication. Extermination of hog tuberculosis is practicable, relatively easy, and should be attained without delay before the disease has gained too much headway.

One of the favorable steps in this direction, and one that will undoubtedly tend to check the advance of tuberculosis, is the enforcement of laws similar to the following, which have been enacted by the States of Iowa and Minnesota. Laws of the Thirty-First General Assembly of Iowa (1906):—

SECTION 1. That every owner, manager, or operator of a creamery shall before delivering to any person any skimmed milk cause the same to be pasteurized at a temperature of at least one hundred and eighty-five (185) degrees Fahrenheit.

SECTION 2. Whoever violates the provisions of this act shall, upon conviction, be liable to a fine of not less than twenty-five ($25) dollars nor more than one hundred ($100) dollars.

General laws of Minnesota for 1903, to prohibit and prevent the manufacture or sale of unhealthful or adulterated dairy products:

SECTION 10. That all creameries before delivering to any patron any skimmed or separated milk shall have pasteurized the same at a temperature of at least 180° F.

Similar laws to the above are at present being considered for Wisconsin and Illinois, but have not as yet been enacted.—(B. A. I. Cir. 144.)

INFECTIOUS CATARRHAL PNEUMONIA.

Causes.—There is a form of catarrhal pneumonia of pigs that is without doubt of infectious character. The infectious nature is established from the clinical history rather than from the finding of a specific organism. It affects pigs under four months of age principally, and is not attended with a very high death rate in those over two months of age. When the disease is introduced into a piggery, it is almost certain to attack all susceptible animals. The period of incubation, that is the time elapsing from the period of exposure to that of the development of the illness is from ten to fifteen days. The young pigs become affected first, while a large percentage of those over four months will escape.

Symptoms.—The first and most prominent symptom is that of coughing and this persists throughout the entire course of the affection. There is also more or less difficulty in breathing. The cough at first is weak but soon becomes loud and is attended with considerable effort. It comes on in paroxysms and then there is a longer or shorter interval of quietude. The coughing spells are almost certain to occur when the pigs first stir about and when they take their meals. If the quarters are clean and the weather pleasant, the coughing is about the only symptom observable. The appetite remains good and the fever is not high. If the weather becomes cold, wet or stormy, the paroxysms of coughing come closer together, sometimes amounting to almost continuous coughing. There will be marked difficulty in breathing, loss of appetite and fever. The other symptoms of illness are rough coat, stiffness, and weakness. Under such conditions there will be a considerable loss of the weaker pigs in the litter and especially of those under eight weeks of age.

The disease may be confused with swine plague or hog cholera. It can be differentiated from the plague from the fact that the latter disease attacks older hogs and the death rate is highest in old hogs. It can be distinguished from cholera by the fact that there is little bowel disturbance and much lower death rate.

Post Mortem.—A post mortem examination reveals clearly defined red patches spread over the lungs. They are most numerous along the edges, particularly along the lower edge of the anterior lobes. On section they show a uniform red color or dirty, rusty grey. They are more solid than normal tissues. There will be more or less frothy mucus in the diseased areas and the bronchi are injected with blood. The lung tissue is firm and dry. The lung pleura over the affected area is diseased but that opposite on the costal pleura is seldom involved. The heart and pericardium remain normal unless the lung is affected in the immediate vicinity. The bronchial glands show enlargement. The abdominal viscera remain normal.

Treatment.—As far as possible, the treatment should be preventive. Pigs that are coughing should not be turned into lots with pigs that appear healthy. Should the disease break out in a litter, the whole litter should be removed from the piggery, the bedding burned and the pen white-washed. The pigs should not be allowed on the range used by other pigs. The treatment of the disease itself consists in securing dry, clean quarters, as little exposure as possible, rich but not bulky food, and trust that age will help give resistance. The administration of creolin or coal tar creosote preparations at the rate of a teaspoonful to the hundred pounds of weight has a good effect. It is best given mixed with the milk.—(Ind. B. 100.)

INFECTIOUS SORE MOUTH.

Causes.—This disease is common in pigs from a few days to several weeks of age and is infectious in character. No specific germ, however, has been found. Dusty, dirty or muddy quarters are among the predisposing causes. Under such conditions the sow's udder is exposed to dust and dirt and acts as a carrier of disease producing germs. The disease may be spread by diseased pigs infecting the teats of the mothers of healthy litters.

Symptoms.—The mucous membrane lining the lips and cheeks is swollen and inflamed. This is frequently quite marked, the snout and lips becoming so badly swollen that the pig can hardly breathe. In the beginning the pig is careless of the teat and as the ulceration progresses, it becomes unable to suckle. The ulcers form quite readily on the lips, snout and tongue, appearing as light colored spots elevated above the healthy tissue. These soon break down and slough off, leaving deep cavernous excavations that may involve several of the teeth, or a large portion of the lips or snout. In extreme cases the end of the lower jaw or the whole snout may drop off. The ulcers on the face and body appear as brown scabs that soon open into deep pits or cracks. The pig acts very dull, is feverish and being unable to suckle, becomes greatly emaciated and soon starves to death. In advanced cases treatment does but little good. If recovery does occur, the pig is usually stunted, or deformed about the face or lips. The disease may end fatally in from three to ten days.

Treatment.—The preventive treatment is very important. The diseased pigs should be isolated from the healthy ones, the pens kept clean and disinfectants used freely. The diseased pigs should be dipped heel foremost into a two per cent watery solution of any of the coal tar disinfectants, or the mouth dipped into a solution of permanganate of potassium (one ounce to the gallon of water). This must be repeated once a day for several days. It is also best to wash the udder of the mother with a similar solution. When the ulceration is well advanced, the dead tissue should be removed and lunar caustic rubbed on the parts. It is usually economy to destroy the badly diseased pigs.—(Ind. B. 100.)

ANTHRAX.

Hogs are rarely affected by anthrax, but when this disease does occur it might be readily mistaken for the acute type of hog cholera. The distinguishing features of anthrax in hogs are the marked swelling of the throat and tongue, with frequently a bloody froth in the mouth, and further by the fact that anthrax in hogs usually follows disease in other animals on the farm, horses, cattle, and sheep being more susceptible to anthrax than hogs.—(F. B. 379.)

RABIES, HYDROPHOBIA, OR MADNESS.

Rabies is one of the oldest known infectious diseases. Hogs do not suffer as extensively from it as do dogs, cattle and horses, but wherever an extensive outbreak of rabies occurs, hogs are usually reported as dying from the disease.

Causes.—The specific cause of rabies is not known, but its being due to a specific germ cannot be disputed. Rabies is a disease produced by inoculation, and in most cases is due to the bite of a rabid dog. The saliva of all animals infected with the disease contains the virus of rabies, but carnivorus animals are the only ones that have a very good opportunity to bite other animals when affected. However, the saliva from any rabid animal, if rubbed into a wound or break in the skin may produce rabies. Hogs sometimes show a disposition to bite and may infect other animals. The average period of incubation is from two to three weeks.

Symptoms.—Rabies in hogs is characterized by very much the same train of symptoms as occurs in other animals. The hog is very restless and excitable, and if lying down or hidden in the litter may jump up suddenly, squeal and run about as if pursued. They will back up as closely as possible in the corner of the pen. The squealing has a peculiar crying sound. They are very nervous and easily startled and will break for a person or other stock. The eyes are at times fixed or may roll about, and there is an abundant secretion of saliva. Frequently they will gnaw the boards of the pen and make desperate efforts to get out. They will bite other animals and swallow indigestible substances. Swallowing is difficult on account of the early paralysis of the muscles of deglutition. The duration of the disease is short. Paralysis occurs early and the hog lies or hides in the litter most of the time and pays no attention to its surroundings. It becomes weak and emaciated and dies in a few days.

Lesions.—The changes in the tissues are neither constant nor specific. The most constant lesions are microscopic in character and are found in the brain. A congested condition of the mucous membrane lining the pharynx, larynx and stomach, enlargement of the spleen and hyperemia (congested condition) of the brain are sometimes seen. Frequently the stomach contains foreign matter, such as stones, straw, pieces of wood, etc.

Treatment.—The treatment of hogs in any way is not practical. As soon as a hog develops rabies, it should be destroyed or isolated in order to prevent its spreading the disease.—(Ind. B. 100).

TETANUS, OR LOCKJAW.

Causes.—Tetanus is caused by a specific germ, *Bacillus tetani.* This organism exists in most soils but is more common in some localities than in others. In warm climates it is more abundant than in cold, and dirt rich in organic matter seems to be the favorite place for it. It enters the body by way of a wound, sometimes so slight as to escape observation. It may follow as a result of castration and any deep or punctured wound that is not open to the air is a suitable place for its development. Tetanus germs differ from some of the other forms in that they do not enter the circulation and become distributed to different parts of the body, but remain at the point of infection. There they manufacture poisons (toxines and ptomaines) that are taken up by the circulation and have an action on the nervous system similar to strychnine.

Symptoms.—The acute form of the disease is usually seen in hogs. The spasms begin with the muscles of the jaws and face, and spread rapidly to other parts of the body, involving especially the back and limbs. Shortly, the hog becomes unable to stand, falls on its side and can not get up. It remains in this position with the limbs extended and rigid. The respirations are labored; frothing at the mouth is noticed and convulsions may occur. The protrusion of the third eyelid is characteristic of this disease. It is very fatal in pigs.

Treatment.—This is limited to preventive treatment, and consists in taking all the necessary precautions against infection at the time of castration and spaying. Medicinal treatment is of little use. The hog should be placed in a pen by itself and kept as quiet as possible. If it will eat, a sloppy diet should be offered. The bowels must be kept open by injections and cathartics.—(Ind. B. 100.)

BLOOD POISONING.

There are two forms of blood poisoning. In the first the germs are picked up by the blood stream while passing a wound and distributed through the body. The result is to cause abscesses or boils in various places, on the surface, and in the organs, as the lungs, liver, kidneys, etc. The distribution may be local instead of general and we have the infection following up a leg or spread out in the body. Its characteristic is the extension of pus. This is known as pyaemia. In the second form there are pus germs present at the wound or point of infection but instead of these being carried away by the blood they remain, and as they grow, produce a poison and this is absorbed and carried about. This may produce profound general shock to the system or inflammation of certain organs. Both conditions may be present at the same time.

Causes.—These are the pus producing microbes, especially staphylococcus pyogenes aureus or albus and streptococcus pyogenes, that enter the tissues through bruises or abrasions permitting the germs to become lodged beneath the skin, or through extensive wounds. Sometimes they remain at the point of infection, but may be transferred from here by the blood stream to distant points, forming suppurating centers, or infect the tissues generally and become widely distributed. This condition is not rare as a result of putrefactive changes in the uterus following an inflammation of the organ, or as a result of retention of the foetus.

Symptoms.—Unless the symptoms follow an extensive infection resulting from a difficult birth, an operation or a large wound, the owner does not connect them with a disease of this nature. At the point of infection, an abscess may form or the part become greatly swollen and oedematous. The body temperature is elevated and in serious cases the appetite becomes impaired. Muscular tremors may be noticed, and the hog becomes dull and stupid. It is generally seen hiding in the weeds or litter or in some cool, quiet place. Sometimes the animal has a diarrhoea. In serious cases, it becomes greatly emaciated and death takes place in a few days. Recovery frequently occurs, and in time the hog begins to thrive.

Treatment.—The treatment is mostly preventive, and consists in proper care being given most wounds, especially if extensive, and in using antiseptic precautions in all operations on the pig. Abscesses should be opened promptly and at the lowest point, so that all the pus can drain out. The after treatment consists in washing the cavity with an antiseptic wash for a few days, and the opening should not be permitted to close until the cavity has entirely filled in. In large wounds we must try to bring about the formation of a healthy granulating surface as soon as possible. If necrotic or dead tissue forms in the wound, it must be removed and a healthy surface promoted by the use of antiseptic dressings. In cases of local septicaemia, this is all the treatment necessary. When the disease is generalized, the treatment is usually hopeless. Alcohol, salicylate of soda, and quinine are the drugs usually given in these cases. Plenty of clean water should be allowed. The animal should be coaxed to eat easily digested and highly nutritious food in order to prevent its becoming weak.—(Ind. B. 100.)

INFECTIOUS ARTERITIS.

Causes.—This disease occurs in pigs a few days old, and is caused by septic germs that enter the system by way of the navel or umbilicus. Filth and dirty pens are among the predisposing causes. If the disease has once occurred in a pen, it is very apt to recur from year to year. Sometimes it assumes the proportion of a local epidemic and causes very heavy losses in a neighborhood.

Symptoms.—The pig becomes very weak, refuses to suckle, is feverish and usually has a diarrhea. The affected joints are swollen and painful. Abscesses form in different parts of the body, sometimes about the umbilicus, and may contain considerable pus. Occasionally the abscesses about the joints break, or one of the feet drops off. In case the pus is along the umbilicus, it may discharge outside and recovery takes place. If it discharges into the abdominal cavity, death is sure to result.

Treatment.—This is wholly preventive. If the disease exists in a litter, the pen should be thoroughly disinfected and the bedding burned. Sows should not be permitted to farrow close to an affected litter, or in a pen where an affected litter has been kept, unless it has been well cleaned and disinfected. Washing the umbilical cord with a 10 per cent solution of creolin or carbolic acid should be practiced when the disease is present in a herd. This will cause the cord to become hard and dry, and will prevent the entrance of the germs as well as disinfect the cord.—(Ind. B. 100.)

SURGERY.

DIFFICULT PARTURITION.

Difficult birth is not as common in the sow as it is in the larger domestic animals. This is because the pelvic cavity through which the foetus passes is large in comparison with the size of the young. A roomy pelvic cavity, however, does not always insure an easy birth, and when the owner fails to take the proper precautions and neglects the hygiene of pregnant animals, there will be plenty of cases of difficult parturition in the herd.

Causes.—The most common cause of difficult parturition in young, fat sows is a large foetus and a narrow maternal passage, a condition frequently met with when a large male is used on small sows. Other causes are malpresentations, monstrosities and diseases of the foetus (hydrocephalus, emphysemia, etc.). Emphysematous conditions are met with when the act of parturition has been prolonged and the foetus is dead and undergoing decomposition.

The only malpresentation met with is the transverse. In this presentation instead of the head or breech presenting, it is the side, back or belly. In prolonged parturition the maternal passages become dry and the passage of the foetus along them is greatly interfered with. In case of debility and exhaustion, the expelling powers are weak in comparison with the resistance to be overcome, and but little progress is made. A dead foetus acts as an obstacle to a rapid birth.

Treatment.—At the time of birth the sow should be in comfortable quarters where there will be no chance of her being disturbed by other animals, and where the necessary assistance and care can be given without the attendant undergoing too many discomforts. The act of parturition may be prolonged and progress very slowly without there being any obstacle to birth, and the tendency on the part of the owner should be not to meddle too soon, but to wait until nature has had a fair chance. In nearly all cases the sow is quiet and in the recumbent position, and her condition can be judged by the progress made during the labor, and an exploration of the parts with the hand. Before making an exploration, the hands should be washed and the fingers smeared with vaseline. If necessary, the finger nails should be shortened. When the hand is large and the passages narrow, the fingers are all that can be inserted. This will be sufficient to judge the condition of the maternal passages and the position of the foetus, if it has gotten as far back as the entrance to the pelvic cavity, or into the passages. The explorer should conduct his examination with all the care, attention and gentleness possible, and take time to assure himself of the true state of affairs.

After becoming satisfied as to the conditions present, we should give the required assistance. We should not go too far in assisting her, nor attempt to do what nature herself could not accomplish under more favorable circumstances. For instance, if the foetus is so large or deformed in such a way that it cannot pass through the entrance into the pelvic cavity, we must not attempt it. In case the sow is restless, she should be given a tablespoonful of tincture of opium, and if necessary, the dose should be repeated. If the parts need dilating, fluid extract of belladonna can be smeared on the os. Dry, feverish passages can be moistened by injecting into them with about an eight ounce syringe, soapy, warm water. The further forward the fluid is thrown, the better will be the results. If the expelling forces are not sufficient to expel the foetus and there is no obstacle to birth, their force can be increased by administering to the sow from half a dram to a dram and a half of extract of ergot and repeating the dose in half an hour if necessary. We must remember, however, that this drug should not be given if there is undue resistance to birth, unless the animal is exhausted and debilitated.

If the difficulty is a malpresentation, it should be corrected with the fingers if the sow is "roomy," or with wire hooks made from number eight wire. The hooks should be crooked about half

Tuberculous Hogs Infected by Working Over a Pile of Manure from Tuberculous Cattle. Dept. of Agr.

an inch, rather blunt on the end, and the shank long so that the operator can manipulate them handily. These hooks are useful in helping to extract the foetus, but are not as handy as some of the many styles of pig forceps now on the market.

After giving the necessary aid, we should wait and watch results. If our efforts have proven unsuccessful, we must then resort to the pig forceps, hooks, etc., and proceed in extracting the foetus. If it has not already entered the pelvic cavity and the passages are narrow, our efforts may prove unsuccessful. This is very apt to be the case if the foetus is emphysematous or dead. The after treatment consists in washing out the uterus and vagina with a two per cent watery solution of creolin.—(Ind. B. 100.)

LAPAROTOMY.

When all effort to remove the young by ordinary means fail, we can then resort to more heroic measures, that of making an opening into the uterus through the abdominal walls and extracting the foetus. In valuable breeding sows this operation is of special value, but should not be attempted by the stockman. It is useless, however, to operate when the sow is exhausted by two or three days of labor and after the foetuses have begun to decompose.—(Ind. B. 100.)

EVERSION OF THE UTERUS AND VAGINA.

One of the accidents following parturition is the eversion or prolapsus of the vagina and the uterus. Only a portion of the uterus is involved, and it is seldom that a complete prolapsus of this organ occurs. This condition may occur before parturition. The chief symptom of this accident is the presence of a tumor protruding from between the lips of the vulva, and which may hang some distance below that opening.

Treatment.—It consists in cleaning the organ with warm water and antiseptics and returning it to its proper position. If the part is badly swollen, take a strip of muslin about two yards long and two inches wide; begin winding from the outer end and wind toward the body and allow the bandage to remain on for ten or fifteen minutes. Keep the body end tight and remove the outer part and then rebind in the same manner. After removing the bandage, apply both thumbs to the center of the mass and return it at once by a slow, steady pressure. The organ can be retained in position by placing a few stout stitches across the lips of the vulva.—(Ind. B. 100.)

CHOKING.

Causes.—Choking may be due to sharp objects when swallowed penetrating the mucous membrane lining the pharynx or oesophagus, and attempting to swallow objects (potatoes, roots, etc.) too large to pass down the canal. Paralysis of the oesophagus may sometimes cause it.

Symptoms.—If the choke is complete, the hog is unable to swallow food, saliva dribbles from the mouth and tympanitis may develop. If not relieved, death will occur from suffocation. The animal may get rid of the choke by vomiting. In partial choke there is difficulty in swallowing and salivation. In thin hogs if the object is lodged in the pharynx, it may be felt by pressing the pharynx with the fingers. If the foreign body is lodged in this region, instead of grunting, the hog will make a shrill sound.

Treatment.—When the foreign body is lodged in the pharynx, it may be pushed forward by pressing below it with the fingers, or a blunt flexible stick can be used in dislodging it. Mucilaginous drenches should be given, but drenches must be given carefully, as there is some danger of their getting into the air passages. Unless relieved soon after the accident has occurred, it is best to slaughter the animal.—(Ind. B. 100.)

HERNIA, OR RUPTURE.

Causes.—Hernia is a condition in which a portion of the intestines or omentum have passed through the walls of the abdomen and lie just beneath the skin. Hernia in pigs is due to congenital defects, as an open umbilicus and a wide inguinal canal, and to increased pressure on the walls of the abdomen by the intestines caused by the pigs piling up and lying on each other, and to crawling through a small opening in the pen or fence. Congenital hernia makes its appearance soon after birth.—(Ind. B. 100.)

UMBILICAL HERNIA.

Symptoms.—Umbilical hernia is recognized by the presence of a swelling or tumor below the navel opening. The swelling is soft and free from inflammation, is larger at one time than at another, and by laying the pig on its back and pressing downwards on the swelling, it may disappear. Pigs with umbilical hernias do not thrive as they should and sometimes become stunted.

Treatment.—The treatment of umbilical hernia is not difficult, and is usually followed by good results. The method of operating is as follows: The pig is placed on its back and held there by an assistant, and with the finger the size and the position of the umbilical opening is determined. If the intestines do not pass back into the abdominal cavity of their own accord, they should be pressed back with the fingers. The hernial sack is then held by the assistant and a strong cord tied around its base close up to the abdominal wall. The ligature should be tied tight enough to cut off the circulation in the sack and cause it to slough off. The swelling caused by the ligature is sufficient to close the opening, and in a few weeks it will become obliterated. The simple ligature will answer for a small rupture, but if large, a multiple ligature must be used. The seat of the operation is first washed with an antiseptic wash. A slightly curved needle carrying a heavy linen thread that has been lying in an antiseptic solution is then passed through the base of the sack close up to the abdomen, the thread divided and each half tied separately, or one half can be tied and the needle carrying the other half again passed through and tied. The operation is repeated until the necessary stitches have been taken. In case of adhesions between the walls of the sack and its contents, the hernia cannot be reduced and it will be necessary to cut into the sack and break them down with the fingers, then close the opening by stitching across from muscle to muscle. Strict antiseptic precautions must be observed in performing this operation. The after treatment consists in keeping the pig by itself for a few days and in keeping the part clean.—(Ind. B. 100.)

SCROTAL OR INGUINAL HERNIA.

Symptoms.—This form of hernia occurs only in the male. The testicles lie toward the bottom of the bunch which may be so large that it drags on the ground. Raising the hind parts of the pig will cause the bunch to become smaller. Strangulation of the intestines seldom occurs. When the hernia is large, the pig does not thrive and will become stunted.

Treatment.—To relieve this condition it is necessary to castrate the animal. The pig should be starved the day before being operated on. The covered operation is the one to be preferred. To remove the pressure from the scrotum, the pig can be hung up by the hind legs or held in this position by an assistant. The scrotum is then washed with an antiseptic wash and an incision made through its walls. The operator must be careful and not cut the covering (tunica vaginalis) of the testicles. The incision should be large enough to allow the testicle and its coverings to be drawn outside the scrotum, and permit the operator to break down with his fingers any adhesions present. A needle carrying a thread is then passed through the tunic and cord as high up as possible, the thread cut close to the needle and the cord and tunic ligated. The ligature should be drawn moderately tight and the cord and tunic cut off about half an inch above it. The ligature should be of strong material and when not in use, it should be kept in a vessel containing an antiseptic solution. The open operation, reducing the hernia, cutting through the coverings of the testicle, removing it and closing the opening the same as in umbilical hernia, can be used. It is best to keep the pig by itself for a few days following the operation.—(Ind. B. 100.)

VENTRAL HERNIA.

Scrotal and umbilical hernia are due to dilation of openings already present; all others caused by a tear or break in the abdominal wall, but not in the skin, are known as ventral hernia.

Causes.—Injuries are the cause of this form of hernia. Lying on one another in the pen, as is the case when they pile up, kicks and collisions with blunt objects are common causes.

Symptoms.—A favorite seat for ventral hernia in hogs is on the inside of the flank, the mass of intestines extending backwards between the hind legs. The size of the swelling varies and presents the same appearance as in other forms of rupture. If caused by a local injury, there is more or less inflammation in the part. This symptom is not noticed in old cases.

Treatment.—Treatment is not as satisfactory as in the other forms. After reducing the hernia an incision is made in the sack, and the opening in the walls of the abdomen closed by sutures the same as in umbilical hernia.—(Ind. B. 100.)

After one year old, all boars should have their tusks removed at least twice a year. This may be done quickly and effectively with a pair of strong nippers or sharp blacksmiths' pincers. Knocking the tusks out with a cold chisel is a cruel and unnecessary operation.

CASTRATION OF YOUNG PIGS.

The age at which castration in young pigs can best be performed is not fully agreed upon. It may be performed when the pig is a few weeks old and still nursing, or after it has been weaned, and when several months of age. Young pigs when nursing the mother do not suffer from the shock of the operation as much as at the time of weaning or when older, and the growth is not noticeably checked. Castration at all seasons of the year and under all sorts of conditions, is practiced, but where the conditions cannot be controlled after the operation, the most favorable seasons for operating are the spring and fall.

Sucking pigs need not be prepared for the operation. In older ones, it is best to starve them for about twelve hours before castrating them, and we should avoid getting the hogs warmed up, as will happen if we have to run them about in order to catch them. This can be avoided if the pigs are shut up in a small pen where the assistant can catch them quickly. One person will be able to confine the pigs for the operation. If the pig is small, the hind legs can be held with the hands and the head and forelegs between the knees; or it can be laid on its side or back and the hind legs drawn well forward.

The operation is very simple. The operator should provide himself with plenty of antiseptic solution. It is best to wash the scrotum with a two per cent solution of some coal tar product, and the knife, needles, ligature, etc., should be placed in a similar solution when not in use in order to prevent infection. The testicle is grasped between the thumb and fingers and pushed against the walls of the scrotum. An incision is made in the scrotum and tunic of the testicle parallel to the middle line or raphe, and from half an inch to an inch to one side. The incision should be made with one stroke of the knife and large enough to allow the testicle to slip out. In young pigs the cord of the testicle may be broken off and removed at one jerk. In older ones it can be severed by cutting and scraping with a dull knife. The opposite testicle is then removed in a similar manner. Before liberating the pig, the incisions in the scrotum should be examined and if they do not extend to the very lowest part of the scrotum, they must be enlarged. This will allow the blood and pus to drain off instead of collecting in the part. The wound requires no after treatment. The pig should not be allowed to wallow in ponds or remain in dirty, dusty or muddy pens.

The operation in the boar with the exception of severing the testicular cord is the same. The cord in old hogs is large and a dangerous hemorrhage may occur if cut off with a sharp knife. Scraping the cord in two with a dull knife, if properly performed, will so crush the blood vessels that little bleeding occurs. Another method sometimes used is ligating it before cutting it off. The best instrument to use is the emasculator. This instrument will so crush the ends of the blood vessels that no hemorrhage follows the operation.—(Ind. B. 100.)

COMPLICATIONS FOLLOWING CASTRATION.

This operation is not free from complications. Observations have proven that they are more common when the work is done carelessly, and no attention paid to antiseptic precautions, than if the proper care and antiseptic precautions are observed. Hernia is a rare complication of castration, but may be caused by jerking the cord too hard when breaking it off, or from an injury to the pig while handling it. When operating we should be prepared to treat all cases of hernia, whether present at the time of the operation or resulting from it. The covered operation should be used for scrotal hernia. Hemorrhage is not a dangerous complication in pigs. In old hogs it will occur if precautions are not taken against it. Excessive bleeding can be stopped by picking up the stump of the cord and ligating it. Packing the scrotum with clean cotton and suturing the incision in its walls may stop it. The cotton should be left in the scrotum for at least a day. Tumor formation in the scrotum is a common complication following castration. These tumors are sometimes enormous in proportion to the size of the pig and grow rapidly. If large, the pig does not thrive and becomes stunted. It differs from scrotal hernia and hydrocele in that it is very hard. The causes are infection of the parts with germs, either at the time of operating or following it, and leaving the stump of the cord too long.

The treatment is to dissect the tumor out. This method of treatment will not be successful unless all the growth is removed. The operation is quite painful and frequently the pig dies as a result of it. If the tumor is small and the operation skillfully performed, the results are usually good.—(Ind. B. 100.)

CASTRATION OF "ORIGINALS."

In "original" pigs the testicles fail to make their appearance by descending through the inguinal canal into the scrotum. Usually but one testicle fails to descend into the bag. It may be found in any part of the abdominal cavity, but in most cases is situated in the region of the flank.

The animal should be prepared for the operation by starving it for about twelve hours. The operator's hands must be clean and the antiseptic solutions and instruments gotten ready the same as in castrating a straight pig. The pig is laid on its side upon the floor or a board, the hind parts slightly elevated, and held there by an assistant. The operator stands at the back and clips the hair from the flank. An incision is made high up in the flank and midway between the point of the hip and the last rib, and large enough to introduce the fingers, or if necessary, the hand. When the testicle is found it is cut off with the emasculator, or the cord ligated and then cut. The incision in the walls of the abdomen is closed with sutures placed about an inch apart. The hog should be kept by itself and the stitches removed in eight or ten days.—(Ind. B. 100.)

SPAYING.

Spaying is performed for the same reason as castration, and, while it was practiced quite generally twenty years ago, it is seldom done now. The necessity for the operation has passed away. It is an operation that is profitable where sows are to be kept until a year or more of age. Under the present method of marketing at eight and nine months it is more profitable to permit the sows to advance to one or two months pregnancy rather than spay and lose a short time in checked growth, and run the risk of a little loss.

When it is decided to spay, the pigs are prepared for the operation as for castration. They should be three months old and weigh from thirty to sixty pounds. The pig is caught and held by two men, upon an inclined board, the head being lowest. The operator stands at the back and clips the hair from the flank over a space about two inches wide and three inches long. An incision is made about midway between the point of the hip and last rib and an inch below the points of the lumbar vertebræ. The incision should be just sufficiently large to admit the finger. The forefinger of the left hand is introduced and follows the back. The ovaries will be found almost directly downward, suspended by a short ligament. They will feel like a raspberry or blackberry and can be mistaken for nothing else. If the ovary can not be found at once, pass the finger backward toward the bladder and search for the uterus (pig bed) and follow it forward to its termination at the ovary. Remove the ovary by tearing it off with the finger or cutting it off with dull scissors. The lower ovary may be removed through the same opening. Close the outside wound with two stitches, using silk thread or silk fishing line.

The operation may be performed through the middle line of the belly, the same as in spaying the bitch. The method is to hang the pig up by a gambrel with a loop for each hock, make the incision about two inches in front of the pubis and remove the ovaries as already indicated. This opening is closed by two sets of stitches, one in the deep muscles and a second in the skin. One of the objections to this method is the danger of small herniæ. In either method the part should be prepared by washing with carbolic acid and the hand and instruments should be clean. The loss from operating is slight.—(Ind. B. 100.)

PROLAPSE OF THE ANUS.

Causes.—Permanent protrusion of the mucous membrane lining the rectum through the anal opening is called prolapse of the anus. The cause is violent straining from constipation, diarrhea, or anything that will bring about a weakening of the spincter muscles of the anus. Sometimes it is seen among breeding sows, due to their eating cinders and pieces of wood, and the consequent constipated condition of the bowels.

Symptoms.—In some cases only a few folds of the mucous membrane appear behind the anus, in other forms a fair sized tumor rather hemispherical in shape, red and slightly painful. When exposed to the air for a time, it becomes swollen and darker in color, and finally becomes dry and the surface cracked. In time it will slough off.

Treatment.—Before replacing the prolapsed tissues, the mucous membrane should be bathed with warm water for a few minutes in order to reduce the inflammation and clean it. The protruded portion can be replaced by pressing on it with the finger. If caused by constipation a laxative of castor oil should be given and soft food fed the animal. Sometimes the prolapse will again occur and need to be replaced. If badly swollen, it is best to bathe it with an astringent solution (five per cent alum solution). To retain it, a stitch can be taken across the anal opening. If the protruded part becomes injured or sloughs, it can be cut off and the margin of the bowel sewed to the margin of the anus.—(Ind. B. 100.)

POISONS.

POISONING BY MEAT BRINE.

Meat brine and washing powders are the most common causes of poisoning in swine, and are always accompanied by an inflammation of the intestines and stomach. Brine from meat barrels and fish kegs is sometimes emptied where hogs have access to it and when eaten will cause an intense inflammation of the stomach and intestines. Hogs will not eat too much salt if they have access to it at all times, but the meaty taste of meat brine probably adds to their desire for it, and is eaten in large quantities.

Symptoms.—These develop in a short time. The animal is restless at first, will run from one place to another, lie down and get up again, stamp the feet and squeal. Vomiting nearly always occurs and a profuse watery diarrhea will come on if the hog lives long enough. Convulsions occur, during which it will throw itself around violently and froth at the mouth. The intervals between the convulsions become shorter and shorter as death approaches. The posterior parts are paralyzed and the animal will drag itself from place to place. The duration of the attack varies from a couple of hours to several days. The animal is sometimes suspected of being mad unless the cause be known.

Lesions.—Upon post mortem the lining membrane of the stomach and intestines is found loosened, sometimes in masses, and there is intense congestion of the entire wall and the peritoneum in contact with it.

Treatment.—The hog should be given all the water it will drink. Linseed oil in large doses can be given. Flaxseed tea is also useful. To quiet the pain, at intervals, a teaspoonful of laudanum can be given. Treatment is seldom successful.—(Ind. B. 100.)

POISONING FROM WASHING POWDERS.

It is a common practice to save the dish water as slop for pigs. Hogs fed on such slops often sicken and die, the symptoms and course of the disease being very much like cholera and are frequently confused with this disease.

Symptoms.—These are diarrhea, vomiting, fever, lameness, partial paralysis, nervous disturbance and death. The course of the disease is from a few hours to several days, apparently depending on the amount of alkali ingested at one time. Death occurs in the majority of cases.

Lesions.—Upon post mortem examination, the lymphatic glands along the bowel are found swollen and dark colored. The mucous membrane lining the intestines is pale and shiny. Other internal organs are also involved.

Treatment.—The treatment is wholly preventive and consists in avoiding the feeding of slops containing these alkalies.—(Ind. B. 100.)

The greatest amount of loss sustained from swine diseases in New York State is among hogs fed upon the swill collected from hotels, boarding houses, and other large institutions. The cause of death in certain outbreaks of disease among swill-fed hogs is the direct poisoning of the animal by the excess of free alkali (washing soda) in the swill. These alkalies come from the powdered soaps used in washing dishes. It appears that small quantities of the powdered soaps do not produce immediate bad results. It is presumable that they can be used in quantities sufficient for the needs of cleanliness with perfect safety, but owing to the danger involved in their use it is safer not to give the water containing them to animals. In addition to the unwholesomeness of garbage and kitchen slops for animal food, and in addition to the losses sustained from the immediate effect of such kinds of food, hogs fed upon it are very liable to contract specific infectious diseases such as hog cholera, swine plague and tuberculosis. The enormous amount of loss among garbage fed hogs, which in this state alone aggregates thousands of dollars annually, suggests the desirability of urging the discontinuing of the practice of collecting swill for such purposes. Certainly if the refuse material is to be used for feeding swine it should be collected and fed while fresh and sweet. When possible, it should be kept dry, and by all means free from alkaline dish water. It is advisable to cook all kitchen or table refuse before feeding in order to remove the danger of infection from specific diseases. The only suitable channel for the disposal of dish water is the sewer.—(N. Y. Cornell B. 141.)

POISONING BY COTTON SEED.

Fatal results follow the feeding of cotton seed, whether given ground, roasted, raw, boiled or as droppings from cattle. Poisoning, however, is not always observed in hogs following cattle fed on this food stuff. The cause of the trouble has not been discovered, all attempts at getting an active extract from the seed having proven unsuccessful.

Symptoms.—The evil effects are not noticed until several weeks after using it as a food. In cases that have been observed throughout the whole course, there is first, dullness, staggering gait, labored breathing, spasmodic in character and usually called thumps, loss of sight, restlessness, walking in a circle and running into obstructions, lying down flat on the belly, and finally sudden exhaustion and death. In the majority of cases, the animals are found dead in their beds or pens ten or twelve hours after they had apparently been in the best of health.

Lesions.—A post mortem examination gives no definite lesions and fails to show any effect that might be attributed to the hulls.

Treatment.—The only treatment that can be recommended is preventive, avoid using cotton seed in any form as food for hogs for more than two weeks at a time.—(Ind. B. 100.)

ERGOT POISONING.

Causes.—Hogs may be poisoned by eating the screenings from the thresher or elevator that contain considerable quantities of this fungus. It may possibly be produced on pasture, particularly rye pasture. This fungus occurs principally on the heads of rye. The disease is not common and when reported in this State, it has almost always been associated with the feeding of screenings and boughten mill feed containing large amounts of the screenings.

Symptoms.—These are lameness like rheumatism, local swelling and tenderness, especially about the joints of the feet although not confined to that region. Gangrenous spots occur upon various parts of the body. The extremities, especially the ears and tail, lose their natural warmth and vitality. Deep red spots that become black and gangrenous appear on the skin. The mouth may become sore. Parts of the ears and tail will crack and drop off and pieces may come out where gangrene occurs on other parts of the body. There is swelling of the eyes, loss of appetite and unsteadiness in standing or walking. In extreme cases the hog may lose one or more feet before dying. The disease may be confused with blood poisoning. The occurrence in several individuals at the same time will aid in making an early diagnosis.

Treatment.—Cut off the poisonous feed. Supply a soft, easily digestible diet. Give iodide of potash in ten to fifteen grain doses twice daily in slop.—(Ind. B. 100.)

A FUNGOUS DISEASE IN CORN.

In 1899 a letter was received at the Nebraska Station describing a very peculiar disease among the domestic animals of Boyd County. From the description given in the letter it was first thought that the disease was due to ergotized grain, but upon investigation no ergot could be found. The general belief of the residents of the infected district was that it was due to an alkali in the water or soil. They gave this affection the name of alkali disease and when an animal became affected it was said that it was "alkalied." This correspondence led to an investigation in July of 1900. The Botanical Department sent a representative, who visited a number of farms that had sustained losses from this peculiar disease. He made a thorough investigation of the fields in which these animals were pastured and also of the food that was fed, and found that wherever this disease existed there was a dry rot on the corn. This dry rot was of a pinkish color. On the farms that had never had any trouble of this kind he did not find any diseased corn. This led him to suspect that it must be the fungus on the corn that was producing the disease. The disease was similar to that caused by cattle eating ergotized grain. In horses it usually affects the hoofs and there is a sloughing off of the hoofs at the coronet band.

A number of chickens were seen on these infected farms where there was a great loss of feathers. On all farms where this trouble existed the eggs were not fertile.

Suspecting the grain, a quantity of corn from farms where this trouble existed was shipped to the University farm, where it was fed to some hogs. In a short time it produced the symptoms observed on the farms in Boyd County. The bristles were shed and the hoofs were sloughing. While in this condition the animals suffered greatly, especially when compelled to move about. The animals became gaunt very rapidly and where this kind of infected feed was continued a large per cent of them finally died.

As mentioned, the owners of the infected stock did not attribute this trouble to the grain but to the drinking water or to the soil. Samples of water were therefore taken from each farm that was visited, and the Chemical Department made examination to determine whether there was an excessive amount of alkali in the water. It was found that the soil did not contain an excessive amount of alkali. The trouble could not therefore be due to alkali in the water. Furthermore, alkali could not produce the symptoms that were present. Chemical analyses were also made of the corn but it was found not to contain any abnormality. The fungus found on the corn was not analyzed at that time on account of other work pressing. As stated, the corn that was sent to the Station and fed to hogs produced the identical disease in them.

Another experiment was then conducted. The dry mold that was found on the corn was cultivated on crackers and corn meal mush, and this was fed to shoats and again the disease was produced, showing once more that this fungus *Fusarium* caused the disease. Again, the facts that this peculiar corn having the dry rot on it was found on every farm on which there were diseased animals, and that it was absent on the farms that had never had any trouble, go to show that the disease must be due to the fungus.—(Neb. 17th A. R.)

WHEAT AND BARLEY BEARDS.

Frequently when hogs are turned on wheat or barley stubble some will die. The symptoms which they present will vary. In some cases it will be an intense sore mouth, in others a general bowel disturbance, and again in others, loud and difficult breathing.

Lesions.—Post mortem lesions show beards in the mouth, stomach and windpipe. A roll of beards may form and get down by the side, or at the root of the tongue, and penetrate the mucous membrane. The animal cannot get rid of them and the parts become intensely swollen and inflamed, interfering with eating and starvation may occur. Plugs of beards may lodge at any point between the larynx and bronchi, producing loud distressed breathing and coughing. In the stomach there may be a slight inflammation of the lining membrane, and if the beards lodge in the membrane and do not soften and pass away, the inflammation is severe.

Treatment.—When the mouth becomes inflamed, the treatment is the same as in simple stomatitis. Plugs of beards when lodged in this part of the digestive tract can be removed. If lodged in the air passages or stomach, they cannot be removed, and the animal dies from suffocation or an inflammation of the parts.—(Ind. B. 100.)

COCKLE-BURRS.

Numerous articles have appeared in the swine breeders' journals and agricultural papers indicating that young cockle-burrs were poisonous to hogs and calves. While the cockle-burr is young and only three or four inches high it is very fleshy and tender, and relished by stock. The claims of poisoning of stock attracted sufficient attention that the Indiana Experiment Station made a chemical examination and a feeding test to determine the poisonous properties, but in both the results were negative. The young plants, stripped of the burrs, were fed to calves, pigs, rabbits and guinea pigs. These were allowed all they would eat. In no case was any untoward effect noticed. We have been called upon to post-mortem some animals claimed to have died from such poisoning, and in all cases death was due to the burrs. A few burrs would be swallowed with the young plants, and their horny prickles would irritate the stomach wall and cause inflammation, which finally terminated in death. In three cases the burrs lodged in the throat and could not be expelled.—(Ind. B. 100.)

PARASITIC DISEASES.

THE HOG LOUSE.

The hog louse is the only insect which causes much trouble in raising hogs, and when it once becomes established in a drove it is not easily exterminated. Fortunately the lice are so large that they can be seen easily, and their presence may therefore be known before they become very abundant. They are liable to appear at any season of the year, and they thrive on hogs of any age or condition. They are found in and behind the ears, back of the shoulders, and in the creases on the lower part of the ham more frequently than elsewhere; if those places are free from them there is little danger that they exist on other parts of the animal. Coal oil is sure death to every louse it touches, but does not always kill the eggs, and must be used with caution to prevent its blistering the skin of the hog. When a large drove is to be treated, the work can be done very quickly by using a spray pump having an attachment for mixing the oil and water, and the pump should be set so that it will use about five parts of water to one part of oil. When such a mixture is thrown over the hogs in a fine spray, only a little of the oil is used to cover the whole animal and if the spraying is done in the evening, nearly all of the oil will have evaporated by morning and there will be no blistering of the skin when the hogs are exposed to the hot sun on the following day. So little oil is used in the spraying that few of the eggs will be killed, and the work should be repeated at the end of a week, and again at the end of the second week. If the work is thoroughly done, three sprayings will be sufficient. If a spray pump is not available, the hogs should be rubbed with a mixture containing two parts of lard oil to one of coal oil, repeating twice at intervals of a week. The sleeping places should be thoroughly cleaned, the bedding burned, and the inside of the buildings thoroughly wet with coal oil.

Even with the most thorough treatment it requires time and patience to clean a drove which has become badly infested, but it must be done if the hogs are to be kept in a thriving condition. It is not difficult to destroy the larger part of the lice, but that is not sufficient, for where there are even a few eggs left in the ears or under the jowls of a single animal the pest will soon become as bad as ever.—(F. B. 100.)

The hog louse is a common cause of thriftlessness in young pigs and when numerous, tends to retard fattening in adult hogs and injuriously affects brood sows and boars. It is advisable and profitable to keep swine free from lice at all ages and stages of their existence and development so far as possible. To this end their houses, pens and sleeping places should frequently be cleansed and disinfected, the woodwork whitewashed, the bedding material kept fresh, clean and dry and the yards free from accumulations of litter and filth. It is impossible to keep hogs free from lice without maintaining sanitary conditions in their quarters and in attempting to rid them of these pests the treatment must include not only the hogs, but practically everything with which they come in contact daily.

To disinfect recently purchased hogs, that possibly may carry disease germs or vermin into the herd, wash them in a warm 2 per cent solution of coal tar dip and repeat the treatment in 10 days or two weeks; or apply the solution freely with a spray pump and rub it in with a brush. The addition of flowers of sulphur at the rate of 16½ pounds to each 100 gallons of dip mixture renders the solution more effective and such a combination solution should be freely used for all forms of mange or chronic disease of the skin in hogs.

To destroy lice a mixture of equal parts of kerosene and machine oil, or one part of turpentine and two parts of machine oil, should be applied to every part of the hog by means of a rag or swab of cotton waste; or it may be applied along the back, from ears to tail, with a common machine oil can and allowed to ooze down the sides of the hog. Repeat the application in 10 days. As a remedy for lice on black hogs crude petroleum oil is successfully used in the University herd. It is mixed with an equal amount of warm water and applied with a spray pump or brush. A repetition of the application, in 10 to 14 days, eradicates lice with certainty. Irritating applications, such as undiluted kerosene, cannot safely be used on pregnant sows, as abortion may follow their use.—(Wis. B. 184.)

The hog louse is a common parasitic pest on swine in Virginia, and one that requires vigorous and persistent treatment to eradicate. The hog louse is one of the largest of the lice which attacks domestic animals. They are readily seen traveling about among the bristles, usually on the neck, back of the ears, moving with a peculiar sliding motion. The eggs or nits are small, white, oval bodies attached to the bristles. Hog lice are found on almost any part of the body, but are most common about the neck, ears and back of the elbow.

These are blood-sucking parasites, and by biting the hog and abstracting blood, they cause much irritation of the skin. The animal rubs on posts and other objects, making the coat look rough and harsh. The parasites and eggs are easily found upon examination. The parasites are transmitted from one animal to another by contact, or from infested bedding or quarters.

Dipping the animals three or four times at intervals of ten days will usually free them from these parasites, providing the sleeping quarters are thoroughly cleaned and disinfected. In dipping to kill lice the coal tar dips of the creolin type are better than lime and sulphur. If the hog wallows are kept well filled with water, to which some of the creolin dips are added every ten days the hogs will usually free themselves from lice. Another good way is to tie gunny sacks or other coarse cloths around rubbing posts and keep these cloths saturated with crude petroleum.—(Va. B. 189.)

But one specie of lice attack hogs. It is a common parasite, however, and often appears in formidable numbers on unthrifty pigs. The hair affords the lice but little protection, and vigorous, healthy hogs are able to dislodge the pests by rubbing against the sides of the pen and against one another. When hogs reach the abattoir during the warm weather, the adult louse is seldom found on them, but plenty of "nits" are usually seen. The lice become dislodged during the shipment and in the pens by the frequent soakings with water that the hogs receive, and by their rubbing against each other.

It is only when a hog is unthrifty or sick that lice are a serious menace to the animal. When in this condition, the hog seems to be unable to dislodge them and they multiply very rapidly. The bite of the hog louse is very irritating and it lives by sucking the blood of its host. The irritation from the bites makes it almost impossible for the hog to rest, and if sick, they help to increase the anemic (bloodless) condition. Lice are a serious handicap to growing pigs, interfering with their appetite and general nutrition. They are said to cause urticaria (nettle rash or heat sores).

Because of the thinness of the hair and the size of the parasite, it is quite easily seen. The favorite seats are back of the ears, along the neck, under the breast, back of the arms and on the inside of the thighs, in fact any place where the skin is moderately thin, and it is not easy to dislodge them.

The hog louse is one of the largest species of the family. When full grown it measures a fourth of an inch or more in length. Its general color is gray with the margins of the head and thorax and most of the abdomen dark. The head is quite long, the sides nearly parallel, with strong eminences just back of the antennae which are set on the side of the head midway from rostrum to occiput; the legs are lighter with dark bands at the joints; the spiracles are enclosed by a black, chitinous eminence, and there is a broad, black band broken near the middle on the last segment. The male has the abdomen marked beneath with a large black area extending forward from the terminal segment. On the feet is an organ that helps the louse to cling to the hair. The eggs are six-hundredths of an inch in length, by three-hundredths of an inch in width, are slightly yellow or dusky whitish in color, and taper somewhat toward the point of attachment. They are usually attached near the base of the hairs.

Treatment.—It is more difficult to kill the lice scattered around the hog houses and yards than it is the ones on the hogs. For this reason it is difficult to get rid of the lice in a drove of hogs, as they again become infected in the sleeping quarters or about the pen. The hair affords but little protection and makes the application of remedies for their destruction quite easy. A number of different remedies and methods of applying them can be used. Kerosene, any of the coal tar products and crude petroleum are common remedies. The hog can be sprayed or dipped with these preparations. An ingenious method of applying the oil is by means of the rubbing post. A good solid oak post a foot or a foot and a half in height is placed in position in the hog lot. One hole is bored in the top to a depth of about eight inches, and two at right angles from the sides, at the bottom of the vertical hole. Soft pine pins are driven in the side holes. The upright hole is filled with kerosene and stoppered. Next a burlap strip eight or ten inches wide is wrapped around the post over the side holes. This after a time becomes soaked with kerosene and the pig will rub against it at the place where it will do the most good. It is not, however, a very thorough way of using the remedy. A better way is to use a spray pump having an attachment for mixing the oil and water. Five parts of water and one part oil should be used. Three or four sprayings are required to kill all of the lice, and should be done at intervals of a week and in the evening. If done in the evening, by the next morning the oil is evaporated and there is no danger of the sun blistering the skin, as would be the case if applied during the early part of the day.

The coal tar preparations are to be preferred as remedies for lice. These are zenoleum, chloronaptholeum, milk oil, daytholeum and a number of others. The hog can be sprayed or dipped with any of these preparations. Dipping is to be preferred, and is a very effective method of getting rid of lice. Pigs a few weeks old can be caught and immersed in a barrel. If a large number are to be treated, it is best to have a dipping tank. The tank should be sunk in the ground and contain enough solution to cover the hog when it jumps into it. Crude oil is the cheapest material to use as a dip. The tank is filled with water to the desired depth, and one inch of the oil poured on the top of it. The hogs are then driven through, and a thin layer of oil deposited on every part of the animal.—(Ind. B. 100.)

Hogs often suffer very much from vermin. Lice are introduced from neighboring herds, and the losses in feeding are often severe, especially among young pigs, when death is sometimes a secondary if not an immediate result. When very numerous, lice are a very serious drain on vitality, fattening is prevented, and in case of exposure to disease the lousy hogs are much more liable to contract and succumb to it. Newly purchased hogs should be carefully examined for vermin, and they should not be turned out with the herd until they are known to be free from these pests.

When the herd is found to be badly infested with lice all bedding should be burned and loose floors and partitions torn out. Old boards and rubbish should be burned. The quarters should then be thoroughly disinfected by spraying with one of the solutions mentioned. After disinfection, as in the case of a disease outbreak, everything about the place, inside and out, should be thoroughly whitewashed.

Vermin are most common around the ears, inside the legs, and in the folds of the skin on the jowl, sides, and flanks. In light and isolated cases they may be destroyed by washing the hogs with an emulsion of crude petroleum or of kerosene, or with a stock dip properly diluted, applied by means of a broom. In severe cases, however, especially where the whole herd is affected, thorough spraying or dipping should be resorted to. In this case a dipping tank will be a great convenience.—(F. B. 205.)

If the pigs are lousy when weaned, dip them twice, ten days apart. Put up short posts in the feed lot and pastures. Wrap these posts with old sacks, and once a week saturate the sacks with crude oil or kerosene. The pigs will rub on these and the oil will kill the lice.—(Colo. Cir. 2.)

For lice in winter use kerosene squirted with a small can along the back and behind the ears. If used in hot weather keep hogs out of sun to prevent blistering. It is better in summer to dip the herd every month. A running stream is good for hogs, but filthy mud holes are not.—(Mo. Cir. 28.)

It has been known to the intelligent hog breeder that the presence of insects on the hog is a very serious matter. It is a fact that very few hogs are free from lice, and that breeders have been accustomed to use various remedies for the destruction of the pest. The favorite seats of lice on the hog are back of the ears, along the neck and under the breast. These vermin are bloodsuckers, and they produce in a short time a very weak, debilitated condition of the animal, making him far more susceptible to other diseases that the animal is heir to. The louse has not been credited with occasioning serious loss, but of late years more attention has been given to this little insect by the Department of Animal Pathology. We have found that the hog louse becomes a more serious enemy when hogs are out of condition. As above stated, it is a bloodsucking insect. If the accompanying conditions are bad, especially if the pens are excessively dusty and through the inhalation of an excessive amount of dust there should be a slight pneumonia of the lungs, the animals badly affected with lice will be all the more apt to die.

It has also been found that where animals affected with cholera were free from lice there was a much smaller percentage of loss sustained than where the herds were largely affected with lice. This has been brought to the attention after examining numerous herds in various parts of the state during the last five years. The first rule that is now insisted upon when one visits an outbreak of cholera is to examine for lice and, if present, to thoroughly destroy these insects. The breeding pens and hog houses are also thoroughly disinfected. All the bedding that is found in pens and hog houses at time of disinfection is burned. The method for disinfecting the hog pens and hog houses is as follows: For the stables use hot water and any of the coal tar preparations, such as zenoleum, chloro-naptholeum, and similar preparations. This is done by making a 3 per cent solution of either of these preparations and using it liberally with broom and brush and also with a spray pump. If you have any of the spray pumps used for spraying trees they will answer the purpose admirably.

After the stables and pens are thoroughly disinfected the animals should be disinfected also. This can be done by dipping them, which is a far easier method than any other. Of course it necessitates a dipping tank. These dipping tanks can be bought on the market very reasonably. If one is not in favor of using the dipping tank, or does not feel warranted in spending the amount that it would cost to purchase one, a spray pump will do the work; but in spraying hogs one should have them on a wooden floor and must have quite a large and forcible pump, so that they can be thoroughly saturated with the liquid. If sprayed, they should also be rubbed with a broom immediately so that the fluid will soak into the skin. The solution that we recommend is from 3 to 4 per cent for grown hogs and about 3 per cent for small pigs. In our experience we have not found any harm resulting from dipping very young pigs.

Spraying and dipping for lice can be highly recommended, as it is the only safe, rational thing to do if hogs are in any way infested with lice; and, as stated above, there is not a breeder of hogs who has not been troubled with this insect. The remedy is to dip, and dip often. It aids the very best balanced ration that can be given to a hog, by enabling him to thrive and assimilate the food administered. Breeders who have begun to dip their hogs find it very economical and a very efficient method of ridding the

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animals of these insects. The coal tar preparations which have been mentioned—chloro-naptholeum, zenoleum, Lincoln dip, and Lee's carbolic dip—leave the skin in a very soft, pliable condition, and I believe that it is a very economical and sensible way out of this difficulty.

In conclusion, I desire to say that I do not wish to convey the idea in this article that it is absolutely necessary to procure a dipping tank. I have known instances where our American farmer, with his genius for making the most of his surroundings, has soon improvised a proper dipping tank with very little cost. It is the purpose of the writer to urge every grower of swine to dip his hogs at least every three to four weeks to have the very best success, and also to use liberally any of these dips in his hog pens; and he will attain the very best results and in a great measure prevent infectious diseases from gaining any foothold on his premises.

We herewith mention one of the well-known sheep dips that has been tried by the Government and found very effectual in the eradication of scab among sheep. The lime-and-sulphur dips are somewhat dangerous. They must be prepared exactly according to formula, or they are liable to produce bad results. It is not uncommon to find cattle with eyes swollen shut after being dipped in too strong a solution of lime and sulphur.

Kerosene Emulsion Dip.

Hard soap or whale oil	½ pound
Water	1 gallon
Kerosene	2 gallons

Dissolve the soap in boiling water and while still hot add the kerosene and agitate thoroughly until cool, when the stock emulsion thus obtained should be of the consistency of thick cream and without the presence of free kerosene. When ready for use, dissolve in about twenty times its volume of water.—(Wis. B. 184.)

SWINE MANGE.

Mange is a common disease of swine. In the fall of 1909 my attention was called to some suckling pigs that were scratching and digging at the skin about the neck and shoulders. These pigs were examined for lice, but none found. A disinfecting solution of creoline gave relief. Later, on making a post-mortem examination on a shoat at another place, the skin on the top of the neck and shoulders was observed to be covered with thick scabs. A microscopical examination of the skin beneath these scabs revealed the presence of large numbers of mange mites. Inquiry among swine raisers indicated that swine mange is a common disease in the State, but not regarded as particularly serious.

Swine mange does not appear to be a common disease in the United States. We have been unable to find any references to swine mange in America, except in Dr. Kaup's little book on Animal Parasites. He refers to swine mange briefly and says, "Not common in the United States." Judging from the numerous references to swine mange in European literature, it would appear to be a common disease there.

The cause of swine mange is a very small animal parasite, commonly called a mange mite, technically named *Sarcoptes scabei, var. suis.* The adult female of the mite can be barely distinguished by the naked eye under favorable conditions, but not upon the skin of the hog. The best method of detecting the parasite is to remove the scabs or crusts from the surface of the pig's skin, as these contain very few parasites. Under the crusts the skin should be thoroughly scraped down to the living skin and the material thus collected examined under a low-power microscope, when numbers of the parasites will be observed. Both adult and smaller nymphal parasites can be seen—the latter being more numerous. It is essential, in collecting material to examine for parasites, that the living skin be scraped to the quick, or, if opportunity offers, a section of the affected skin removed, as the parasites live right on the surface of the skin. An examination of outer skin scrapings seldom reveals parasites. The hog-mange mite burrows in the outer layer of the skin. The adult female lays eggs which hatch into young mites, and these go through the various stages of development on, or in, the outer layer of the skin of swine.

The symptoms of swine mange are first seen in suckling pigs. They scratch and dig at their sides and neck with their hind feet, and often rub against posts or other objects. After weaning, the pigs do not develop as they should. The hair stands erect, thick crusts or scabs form at the roots of the hair in the region of the withers, top of neck, and about the ears and face. The scabs often extend to the root of the tail, and transverse cracks form in the scabs along the back and even some distance on the root of the tail. It has been reported that sometimes the mange is so severe in suckling pigs as to cause the tips of the ears to shrivel and drop off, and that the tails also slough off from the same cause. This we have not observed, and further evidence is needed to prove that mange is the cause of the sloughing off of portions of the ears and tail.

The mange mites live on other portions of the hog's body, particularly on the inside of the thighs and along the belly, where small red spots appear, without scabs of any size. The scabs on the top of the neck and shoulders seem to be thicker and more extensive in pigs or shoats from four to eight months old that have a heavy coat of hair. A shoat of this age, when suffering from swine mange, appears stunted, does not eat well or thrive as he should. When the pig gets older, under good treatment the disease appears to lessen somewhat and in adult swine seems to cause comparatively little discomfort. In old hogs there is little scratching, the scabs are not large and the animal does fairly well, although the mange is still present. There are very slight scabs over the shoulders, and a sow will transmit the disease to her suckling pigs by contact.

The scab symptoms of swine mange show most plainly on white hogs, but white hogs do not seem to suffer more from the disease than dark-colored hogs. In our observations the darker colored pigs seem to suffer more from the disease than white, but this seems to be due to the fact that darker colored pigs, as a rule, have heavier coats of hair. There is a rather common impression that light-colored or white swine sunburn in the Southern States. From observations, both in Virginia and Cuba, we do not think this is true, but we are inclined to the opinion that the so-called sunburn is swine mange, which is more noticeable, but not more common or severe, on white pigs.

Swine mange is spread by direct contact with an infected animal or by infected quarters, bedding, etc. The disease is more severe and symptoms more pronounced during the winter season. This is probably caused by the cold weather decreasing the circulation in the pig's skin, and by a lack of a variety of food, such as is not usually available in the summer. It is possible that the sunlight in summer, also, has an injurious effect upon the parasites. As a general rule, unless swine are severely infested, the disease largely disappears during the summer when the pigs are allowed to run on pasture. European writers state that swine mange may be transmitted to man, upon whom the parasite will live a few days. We have not received reports of any such cases.

The treatment of swine mange consists in the external application of substances that will kill the parasite without injuring the animal, and the disinfection of the quarters so that the animal will not become infected again. In addition to the medicinal and sanitary treatment, it is also important to give the animals good care and plenty of nourishing food, as a thin, unthrifty pig is particularly susceptible to the disease. There are many medicinal substances that will kill the parasites and cure swine mange when properly applied. In our work we have considered particularly the ease with which the remedy could be procured and applied, its efficiency and economy.

The best form to apply the remedy is in a solution or emulsion that can be applied to all parts of the pig's body. Ointments applied to the visibly affected parts of the skin are useful in keeping the disease in check, but the whole surface of the pig's body should be thoroughly treated, in order to complete a cure. This is best done by dipping the pig, or by scrubbing or hand dressing where dipping is not practical.—(Va. B. 189.)

This affection of the pig is frequently alluded to in journals devoted to the swine industry, and is described in nearly all of the old works on diseases of swine. It is a rare affection and of little economic importance. Because of the disease being so frequently mentioned, we include it with the other parasitic diseases, although we have never seen a case in this State.

Hogs have two forms of mange; the sarcoptic form, and the demodetic form. The demodex of the pig is a worm-like parasite, shaped something like a laurel leaf and about one one-hundredth of an inch in length and one-fifth as broad. It comprises three parts; head, thorax, and abdomen, the first two being joined in a single organ. The mouth parts are horse shoe shaped. Their length and the cephalo-thorax is about equal to the length of the abdomen. The mouth parts comprise, first a pair of mandibles; second a pair of jaws; third a narrow tongue. On the sides of the thorax are four pairs of short, mobile legs formed of three parts, the last part being fitted with two claws. The abdomen is long, conical and striated transversely. It shows at the anterior part of its ventral face a longitudinal slit, the anus, which is much larger in the female than in the male, and may serve for copulation and ovulation. The abdomen of the male is less developed than that of the female, and possesses a genital armature situated immediately in front of the anus.

The young parasites are small and narrow and have but three pairs of legs. The eggs average twenty five-hundredths of an inch long and are ovoid in shape. The larva undergoes three metamorphosis before reaching the adult state. It no doubt passes through the different stages of development in the follicles of the skin, but may migrate over the surface of the skin when it reaches the adult stage and before laying eggs.

Symptoms.—The finer parts of the skin are affected; the snout, neck, chest, abdomen, flank and inner part of the thighs. The inflammation begins in the region of the hair follicles and sebaceous glands. Pimples and pustules appear, varying in size from that of a grain of sand to that of a hazelnut. As the disease progresses large purulent islands varying in size and containing many acari are formed. Ulceration may follow. In the older diseased areas and when the disease lasts for a long time, the skin becomes sclerotic (hard) and many times its normal thickness. Inside of the pimples the mites can be found in all stages of development. In the small abscesses there may be from fifty to one hundred, in the larger ones a thousand. Follicular mange is said to be more contagious in the hog than it is in other animals, and is considered a serious disease.

The scab mite is one of the largest of the specie and when found can be seen with the naked eye. They work deep in the skin, and it is difficult to find them. The female is about one-fiftieth of an inch long and almost as broad. The male is not as large. The mite has eight very short, thick, conical shaped legs, the two posterior ones being quite or almost concealed beneath the abdominal surface. On the dorsal surface are a number of parallel ridges interrupted by conical projections. Toward the posterior part of the body are a few hairs.

Symptoms.—It begins with a violent itching about the head, especially at the base of the ears, about the eyes, and gradually extends to the neck, withers, inner surfaces of the thighs and the whole body. The invaded areas of the skin are first covered with little red pimples. Abrasions from the hog rubbing itself soon occur. The secretions and scales from the skin gradually accumulate, the bristles drop out or become matted and the skin is greatly thickened and wrinkled. In old cases the scales on the skin give it a dirty white color. The mites live in galleries in the deeper layers of the skin and they multiply rapidly. Hog mange is not communicable to other animals.

Treatment.—Hog mange is difficult to treat. It does not seem to travel rapidly among hogs, and can be controlled by isolating or destroying the affected animals. The pig houses and pens should be disinfected or the pigs moved to fresh quarters after being treated. The skin must be rubbed with a strong alkaline soap before applying the remedy in order to remove as many of the scabs as possible. A tobacco dip can be used, but in severe cases a mixture of 8 parts of turpentine and one part flowers of sulphur is a better remedy. It is best to apply the remedy with a brush and rub the skin quite hard. Sulphur or nitrate of lead ointment may be applied when the infection is slight.—(Ind. B. 100.)

For mange, use equal parts sulphur and lard, with enough kerosene to make a paste.—(Mo. Cir. 28.)

WORMS.

Intestinal worms most frequently infest growing pigs, but the young animals usually withstand their ill effects successfully and get rid of the parasites, if generously fed and properly managed. Insufficiently fed, neglected pigs, living in dirty pens and yards, fed from filthy troughs and swill barrels, drinking contaminated water, bathing in old hog wallows and rooting and sleeping in manure piles and stock bottoms, soon are infested with worms. In consequence they fail to thrive and become pot-bellied, rickety, profitless runts, or quickly succumb to the effects of parasites, or of some ailment readily acquired and made deadly by their presence.

The round worm is most commonly found, and inhabits the small intestines. The thorn-headed worm also inhabits the small intestines and adheres to the lining membrane by hooks. This worm is less common and fewer in numbers than the round worm, but causes more irritation. Other worms met with in the intestines do little harm and the kidney worm, so often spoken of by farmers, is comparatively rare and does not cause paralysis of the hind quarters as commonly supposed. The lung worm, found in the air passages of the lungs, is a common cause of cough.

For destroying worms, turpentine is a proper remedy, being given in the slop for three successive mornings at the rate of one teaspoonful for each 80 pounds of live weight. Sulphate of iron (copperas) is an effective remedy, if given as follows: Dissolve half a pound of copperas in warm water, and mix in the slop for 100 pigs for 5 successive mornings and repeat as required. Either turpentine or copperas may be given occasionally as preventives in herds where worms have been prevalent. In bad cases, where immediate action is imperative, affected pigs may be given 5 grains of calomel and 8 grains santonin for every 100 pounds of live weight. The pigs should be starved for at least 12 hours before receiving this medicine, which is best given in a thin slop. Santonin is a dangerous drug unless used strictly in the proportions given.—(Wis. B. 184.)

COMMON ROUND WORM.

The natural habitat of the common round worm is the small intestine. It is sometimes found in the large intestines and the stomach. Its presence in the stomach occurs only when the hog is dead, and is reached by a reverse peristalsis of the intestines or the movement of the worms themselves. When quite active and present in large numbers, they may work forward into the oesophagus. It is not uncommon to find them extending into the common bile duct, some even enter the gall bladder, while others imbed themselves in the ducts coming from the various lobes of the liver. In young and unthrifty pigs round worms are common parasites, and it is not unusual to find from ten to twenty of them in a single individual. They may be present in such numbers as to almost fill the lumen of the intestines for several feet of its length. There are few pigs over the country that do not harbor this parasite to a greater or less extent. Men who treat hogs for cholera and swine plague are quite familiar with this worm, and report it as being quite common.

Description.—The *Ascaris suilla,* Dujardin, is a large round worm, tapering at both ends, and white, or yellowish white in color. The body is firm and elastic, the digestive tract quite complete. The average length of the female is ten inches, that of the male six and a half inches. The head is small and armed with three lips, the upper one having a papillae at each of its inferior angles, the other two at the middle of their base. The female organs consist of a pair of convoluted tubes, each dilating into a uterus and uniting to form a single tube, the vagina. The opening from the vagina, the vulva, is situated toward the anterior third of the body in the middle of an annular constriction. The male organs are simple, consisting of a single convoluted tube dilated below to form a seminal vesicle, and terminating in an ejaculatory duct which opens into the cloaca. The posterior extremity is furnished with a large number of papillae, some of which are back of the anus. The ova are about one four-hundredths of an inch in length.

Source of Infection.—The eggs of the ascaride are passed out with the excreta and drop to the ground. Moisture and warmth are necessary for their hatching, but they seem to be able to live under unfavorable conditions and will resist drying for some time. When the conditions are favorable, the eggs hatch and the pig becomes infected by taking the immature form into the digestive tract along with the food, or the embryo, when well formed in the egg, reaches the digestive tract with the food, the shell is dissolved by the gastric juice and the embryo liberated. Earth eating pigs are almost sure to become infected. Feeding hogs on dirty feeding floors or on the ground, and drinking from ponds and dirty watering troughs are common sources of infection. The best of hygienic conditions may not prevent infection, but will greatly lessen it.

Symptoms.—Unless a number of ascarides are present in the intestines, no marked symptoms of disease occur. Whenever the pigs are kept under conditions unfavorable for growth, they usually become infested with a large number of intestinal parasites, and the irritation to the intestines will help in causing the animal to become stunted. They also obstruct the passage of the food along the intestines, and the maintenance of the colony of worms taxes the animal to some extent. The symptoms shown do not differ greatly from those seen in chronic indigestion. The presence of worms in the faeces help very much in diagnosing the trouble. Pigs weighing from twenty-five to one hundred pounds are the most frequent sufferers. In thrifty old hogs, they are never present in large enough numbers to cause any harm. Young hogs are sometimes very restless, and may manifest other nervous symptoms.

Treatment.—The preventive treatment is very important, and consists in bettering the sanitary conditions under which the pigs are kept. Wallow holes should not be allowed to form in the yards, the water supply should come from a deep well, and clean feeding floors and watering troughs provided as far as possible. To enable the pigs to resist invasion, they should be kept in good condition. To destroy the worms or drive them out of the intestines, a number of different drugs can be used. The simplest treatment for intestinal worms is turpentine in milk. The dose given is one teaspoonful of turpentine for every eighty or one hundred pounds of live weight, and is more effective if repeated three days in succession. A mixture of powdered areca nut and worm seed in teaspoonful doses is also recommended. Santonin five grains and calomel three grains for every eighty pounds of live weight is a very effective remedy for round worms. All powdered drugs are best given in ground feed and should be well mixed with it, or each pig will not get the proper dose. In dosing a large number, they should be divided into small bunches and each bunch dosed separate. The best results are gotten when the pigs are starved for about twelve hours before giving the remedy, and when a physic is given along with it or immediately after. Castor oil or calomel are the physics usually given, especially the latter, as it is very effective and can be readily given along with powdered drugs. Turpentine need not be followed by a purgative.—(Ind. B. 100.)

THORN HEADED WORM.

Among the parasites of the small intestines occurs one species of the genus Echinorhynchus. It is usually found with its proboscis imbedded in the wall of the small intestine, well toward the anterior part. It is seldom found in the large intestines. The round and thorn headed worms are frequently present in the same animal, but the two genera are quite distinct, and the most careless observer is able to distinguish between them. The echinorhynchus is not as common as the ascaride, and is not found in as large numbers. It is uncommon to find more than five or six thorn headed worms in the one animal. The loss occasioned by this parasite some years is quite large. A single slaughter house in this state estimated their losses at $7,000 due to poor sausage casings. This must be only a trifle compared with the loss to farmers from lack of thrift. The female when full grown is the largest worm infesting hogs. The average length of the male is three inches, that of the female ten inches. The body is milky white in color, irregularly wrinkled transversely and tapering to a blunt point at its posterior extremity. No digestive tract is present. The genital opening in both sexes is at the posterior extremity of the body. The eggs average about one two-hundred and fiftieth of an inch in length, and are smooth and cylindrical in shape.

Source of Infection.—The eggs pass out with the faeces, become mixed with the manure and scattered around the pens and pastures. White grubs which are very plentiful in dung heaps become infested with the immature form of the worm. Hogs become infested by eating the grubs which they hunt for in loose, rich soil. The per cent of infection will vary according to the locality and the season of the year. Those pasturing upon sod, especially clover sod, show greatest infection.

Symptoms.—When a number of thorn headed worms are present in the intestines, they greatly irritate the lining membrane and cause serious symptoms of disease, especially in young pigs. The symptoms as described by observers are loss of appetite, constipation, diarrhea, restlessness, general emaciation, weakness of the loins, and in very young pigs, convulsions and spasms. When the infection is light, no noticeable symptoms occur. At the point where the worm attaches itself, the intestinal wall is inflamed. The inflamed tissue is about a quarter of an inch in diameter and depressed in the center where the rostellum is imbedded. Sometimes the head of the worm is buried more deeply than the mucous coat, and the muscular and serous coats become inflamed. Perforations of the intestines have been reported, but such a lesion should be questioned. When the intestines are badly infested by parasites, they are easily torn when handled because of the inflammatory changes in their walls, and the tear is sometimes mistaken for a perforation.

Treatment.—As a preventive measure, we should not allow hogs to root around old straw stacks and manure heaps. Sometimes white grubs are very plentiful in old hog lots. Plowing the lots occasionally will help to free them from grubs. The turpentine treatment as recommended for the common round worm is a very effective remedy, and should be given three days in succession. Better results are gotten if the hogs are dieted over night, and the turpentine administered in the morning.—(Ind. B. 100.)

PIN WORMS.

The pin worm is quite small. It inhabits the caecum and colon of hogs, and may be found in large numbers in this part of the intestine. Unless looked for carefully, it escapes notice. The body is white or brownish in color, straight and pointed at both ends. The male is half an inch in length; the female a little longer.

Pin worms cause but little if any digestive disturbance. Irritation to the walls of the caecum or colon does not interfere as much with digestion, as would an irritation to the stomach or small intestines. They are seldom present in large enough numbers in the intestine to cause any noticeable irritation, but no doubt in conjunction with other parasites, they help to aggravate the symptoms of parasitism. The pig becomes infested through the food supply. —(Ind. B. 100.)

WHIP WORM.

Description.—The whip worm is commonly found in the large intestines, generally the caecum. It is about one and a half inches in length. The anterior two-thirds of the body is capillary and very thin, the posterior one-third suddenly expanded, thick and cylindrical in shape. The caudal extremity of the male is coiled, and a number of short spines are seen behind and around the sheath of the spicule, the point of which is rounded.

Method of Infection.—Pig becomes infected by taking the eggs into the digestive tract along with the food. The eggs usually contain well formed embryos which are said to develop into the adult form in about four weeks.

Symptoms.—No serious trouble is attributed to either whip or pin worms. When present in large numbers, they no doubt cause considerable irritation and may aggravate the symptoms in other parasitic affections.

Treatment.—The same treatment as recommended for other forms is indicated here. In addition rectal injections of soapy water can be administered.

KIDNEY WORM.

When a hog is paralyzed in its hind quarters swine breeders usually call the disease "kidney worm." This statement may also be used when the pig is not doing as well as it should. A few years ago the kidney worm was claimed by some to cause hog cholera and swine plague. The origin of these statements is not reliable, and the presence of the worm under such conditions is only a coincidence. The kidney worm occurs in the fat around the kidney, in the kidneys and sometimes in the liver. It is usually found in cysts or canals and several may be seen in one cyst. They more often occur in pairs. As a result of the irritation, there is more connective tissue in the region of the cysts than in the rest of the fat, and it may contain pus. It is not uncommon to find kidney worms in the pelvis of the kidney, and frequently its walls and the ureter are inflamed and thickened. Sometimes the kidneys are inflamed and contain abscesses. This latter condition in the absence of the kidney worm is not uncommon. The kidney worm is mottled but when seen against the fat appears dark colored. The body is cylindrical, plump, and slightly tapering at both ends. The male is from an inch to an inch and a half in length and about one twenty-fourth of an inch thick.

The female is some larger than the male and will average about an inch and a half in length and one-twelfth of an inch thick.

The curved tail has a conical shaped tip and is winged laterally.

Method of Infection.—The way in which hogs can become infected has never been demonstrated. In all probabilities the eggs pass out in the urine, and the embryo after developing for a time in some moist place or in water, is taken into the body with the food the same as in other parasitic forms. It is believed that no intermediate host is required and the infection occurs direct.

Symptoms.—Hogs affected by the kidney worm rarely show symptoms of disease. In some cases diseased changes are noted in the kidneys and in the fat around them; sometimes the liver shows a few lesions. In these cases the symptoms are the same as manifested in diseases of these organs. This parasite seems to be of little economic importance.

Treatment.—The preventive treatment indicated is the same as for the intestinal forms. It is useless to try and treat them as they are beyond the reach of any medicine, unless by such drugs as are eliminated by way of the kidneys.—(Ind. B. 100.)

In many sections of the United States in which hogs are raised one frequently hears farmers complain that their hogs are "affected with kidney worms." Indeed, many farmers go so far as to pronounce a positive diagnosis of kidney worm when they notice that their animals are not in a good state of health.

Because of the hog's habits, it is difficult to see any practical measures which can be adopted to prevent infection. Feeding from troughs and supplying plenty of pure drinking water will decrease but not exclude the disease. Leuckart's advice to the Germans, "Swine should be kept in a less swine-like manner," holds good in all countries and in connection with all diseases. It is equally impossible to suggest practical methods of treatment. This is all the more true because it seems probable that a number of distinct complaints are popularly grouped together by the farmer as kidney worm disease.—(B. A. I. 153.)

LUNG WORM, OR WHOOPING COUGH.

The lung worm (*Strongylus paradoxus,* Mehlis) is a common parasite in pigs under six months of age. It is found in the bronchial tubes. When the infection is slight the worms are found mostly toward the apex and margin of the lungs. In these cases the lesions are not marked, and it is necessary to examine the lung very carefully in order to detect them. In examining lung tissue for this parasite, it is best to cut off the apex, and by squeezing it between the fingers, force the lung worm out of the broncheole onto the cut surface of the lungs, where they can be readily seen. It is the only lung worm affecting hogs and may occur in sheep.

Lesions.—These are usually slight, and depend on the number of lung worms present or the duration of the infection. The worms are found in the bronchial tubes mixed with the mucus, and when badly infected, the mucous membrane lining the smaller tubes becomes inflamed. As well as irritating the air tubes, it acts as a mechanical obstruction by plugging up the smaller bronchi, and causing a lobular pneumonia. The involved air cells usually return to the normal, but may go through other diseased changes. In some cases the effect is to enlarge the bronchi or to cause saculation.

Method of Infection.—The life history of the lung worm is not fully known. In most domestic animals infection with lung worms depends largely on the humidity of the soil, and is more prevalent on swampy pastures containing ponds and stagnant water than it is on high ground. This disease is more prevalent during wet seasons. Lung worms are often present in pigs when kept under the best possible conditions. The eggs are laid in the bronchial tubes. Before they hatch it seems necessary for them to be expelled by coughing, and undergo a part of their development outside of the body. Just what these changes are is not known. In all probability the pig becomes infected through the food supply, by rooting in the mud and by inhaling the immature form in the dust that may accumulate about the sleeping quarters and pens, as a result of the mud carried on the bodies of the animals.

Symptoms.—The disease is largely confined to pigs. The first symptoms begin as a cough, occurring upon leaving the bed, after exercise and after eating. In badly infected cases the paroxysm of coughing is quite severe, beginning slowly and becoming harder and harder, and finally the pig will put the nose on the ground and press hard while coughing. The paroxysm ends by the expulsion of some mucus or by vomiting. This is referred to frequently in the journals as whooping cough in pigs. The cough may become frequent and persistent, and is generally spoken of as chronic. In the majority of cases the infection is so slight that the presence of the lung worm is not suspected by the owner. The appetite remains good in such cases and the thriftiness of the pig is not interfered with. Death seldom occurs and as the pig grows and thrives, it gradually recovers from the affection.

Treatment.—Keep the pig in a healthy, growing condition. Conditions in pastures and pens should be as hygienic as possible. Drinking water should be pure, and all ponds and mud holes drained or filled. Clean watering troughs and floors are necessary. The sleeping quarters should not be dusty. Medicine is of little value. Feed a highly nutritious ration, and wait until age will give the necessary strength and resistance to overcome the disease.—(Ind. B. 100.)

Young, growing pigs are sometimes attacked by lung worms, which bring about an inflammation of the air passages. The most important symptoms produced by these are general unthriftiness, and a hard cough. Old hogs are rarely attacked and the younger hogs usually recover. The worms that produce this trouble are very small (one-half to 1 inch in length) and examination of the frothy expectoration of sick hogs or of the lungs after death is usually required to make a positive diagnosis. In this disease there is an entire absence of symptoms of acute illness such as usually accompany an attack of hog cholera. This fact coupled with the cough would point to lung worms; examination of the lungs and expectoration with a magnifying glass will serve to clear up doubtful cases.—(F. B. 379.)

LIVER FLUKE.

The common liver fluke, *(Fasciola hepatica,* Linn), is more common in cattle and sheep than it is in hogs. Liver flukes are apparently of little importance in hogs in this country. They may affect other organs besides the liver, but this is the chief abode of the parasite. It is generally found in low lands and is more prevalent on wet than on dry years.

Life History of Fluke and Method of Infection.—Although the life history of fluke is of little importance to us at present, it is well for us to know something about their development. Their life history in brief is as follows: Each adult worm is capable of producing an immense number of eggs (thirty-seven to forty-five thousand). These pass down the biliary passages into the intestines and become mixed with the faeces. Those that reach some favorable place for development after a long or short period of incubation (from ten days to three months) depending on the amount of heat and moisture, become a ciliated embryo. The ciliated embryo swims in the water and seeks certain snails, penetrates into the respiratory cavity of these animals and encysts. The sporocyst, which it is now called, at the end of about fourteen days is about one fiftieth of an inch in length, and the germ cells present develop into a third generation, known as rediae. The rediae escape from the sporocyst when the latter is from two to four weeks old. They then wander to the liver of the snail and from the germ cells present in the body cavity of the parasite develop the next generation, the cercariae. This latter form resembles the adult parasite. It may remain in the body of the snail for some time or pass out and attach itself on the grass or aquatic plants around the margins of the pond and encyst. The different animals become infected from eating these snails along with the food, or from eating grass infested with the cercariae. The development will last from ten to twelve weeks. Each sporocyst may give rise to from five to eight rediae, and each rediae to from twelve to twenty cercariae.

Lesions and Symptoms.—These are directly dependent on the presence of the flukes in the body, and as the liver is the organ generally affected and the chief abode of the parasites, the principal lesions are in this organ. The flukes are confined to the gall ducts, but may pass out into the proper tissue of the liver. There is a catarrhal inflammation of the bile ducts. The smaller ones may become dilated and form cysts. The inflammatory processes extend from the ducts to the connected tissue of the liver and it becomes hypertrophied and the liver cells are destroyed to some extent, depending on the amount of infection, and a large portion of the liver is a mass of cicatricial tissue. The gall is changed in character, is less thick, greenish brown or dirty red in color and contains liver cells, blood cells, etc. These changes in the liver and in other organs as well, lead to changes in the body nutrition and the animal may become anemic, weak and emaciated.—(Ind. B. 100.)

LUNG FLUKE.

The lung fluke, *Paragonimus Westermanii,* is sometimes found encysted in the lungs of hogs killed in the abattoir. Dr. A. J. Payne, chief inspector in charge at Cincinnati during the latter part of 1898, found one per cent of the hogs killed in the abattoir affected with this parasite. The hogs were in good condition and only a few cysts were found in each lung. The muscle flukes in American swine are probably young specimens of the lung fluke. Its complete life history has not yet been determined, but according to present knowledge the worm does not develop until after it leaves the host in the sputum. Some observers have succeeded in raising the embryonic stage, but beyond this nothing positive has been demonstrated. This worm has been found in man, cat, dog, tiger and hog. —(Ind. B. 100.)

MEASLES.

Measles of the pig is a parasitic disease caused by the *Cysticercus cellulosæ.* Rud, a larval form of the Taenia solium, a tapeworm sometimes found in man. The frequency of measles corresponds with that of the tapeworm, as the pig becomes infected by eating human excrements which contain segments of this parasite. The bladder worms or cysticerci are found in the muscular tissue, especially in the region of the abdomen, in the tongue, heart, neck, shoulders, pelvis, flank and superior regions of the legs. They may be found in other organs as well. The adult cysticerci represents a small vesicle about the size of a pea or bean, of a dull white color and provided with a head and neck. This is marked externally by a dark spot which is bent in toward the inside of the vesicle.

Method of Infection.—Man harbors the adult worm, Taenia solium, and hogs become infested with the larvae by taking into the digestive tract the segments of the parasite that are passed out with the faeces. These contain a large number of eggs and on reaching the stomach are freed from their shells by the dissolving action of the gastric juice. The embryo is then free, perforates the intestinal wall, or enters a small blood vessel and drifts along in the blood stream until it reaches a suitable place to develop. Nine days after infection a small oval vesicle forms in the infested tissues. In twenty days, the bladder worm is about as large as the head of a pin, and in sixty days it has grown to about the size of a pea. It is then enclosed in connective tissue and has fully developed, and at the end of this period a well formed neck can be seen. Degenerative changes take place quite early. The connective tissue capsule becomes infiltrated with lime salts, and gradually the whole parasite undergoes a calcareous degeneration.

Symptoms.—There are no definite symptoms. Some investigators have described as symptoms of measles, a hoarse voice, falling out of the hair, depression, loss of appetite, weakness, emaciation, a partial paralysis, diarrhoea and oedematous swellings in the region of the head, neck and shoulders. A more positive diagnosis may be made by examining the visible mucous membrane of the mouth, especially in the region of the tongue, for the characteristic lesions. When the tissues in these parts are affected, small pimples may be felt or seen on the mucous membrane. Blindness, rabiform symptoms, etc., have been reported in cases of general infection of the tissues, and within a variable time exhaustion and death.

Treatment.—This is wholly preventive. Pigs should be prevented from ingesting the fecal matter of man by using proper precautions. The importance of this parasite lies in the danger of man becoming infested with the adult worm. The Taenia solium is an armed tapeworm and gives rise to much more serious symptoms than the more common unarmed form. The infection results from the eating of uncooked pork. Man may also become infested with the cysts. This may occur in various ways; as a result of a reverse peristalis of the intestine carrying a gravid segment into the stomach, from a contaminated water supply and from the hand becoming soiled at the time of defecation. In man the bladder worm may develop in the eye or brain, and give rise to very serious symptoms. The preventive treatment consists in tanking the parts infested with cysts and eating only well cooked pork.—(Ind. B. 100.)

BLADDER WORMS.

The bladder worm, *Cysticercus tenuicollis,* Leuck, is another tapeworm larvæ occurring in the body cavity of swine. It is also found in cattle and sheep. The adult tapeworm, *Tænia marginata,* Batsch, is found in dogs and wolves. These bladder like bodies are a half an inch or more in diameter and are usually found on the folds of the omentum.

Method of Infection.—The eggs of the Tænia marginata pass out with the excrement of dogs and become scattered around on the ground. Infection takes place the same as in some of the other parasitic forms, the egg containing the six hooked embryo entering the digestive tract along with the food. The embryo on reaching the stomach and intestines is liberated by the digestive juices. It then migrates from the intestines, either by crawling or by drifting along in the blood until it reaches the liver. About four days after infection, it can be seen in this organ, lodged in the finer branches of the blood vessels which it transforms into tubes, and having the appearance of a small round kernel. After remaining here for a short time, it leaves the liver and falls into the body cavity and usually encysts on the omentum. Here it remains until fully developed, which requires several months. In time, as is the case with the cysticercus, it undergoes degenerative changes. If the cyst is eaten by a dog the scolex or head is freed from the cyst by the digestive juices, and the suckers and hooks attach themselves to the wall of the intestine and developments of the segments of the tapeworm begins.

Symptoms.—The symptoms produced by the bladder worm are not noticeable. No deaths have ever been reported in hogs from infection by this worm. When the infection is heavy, inflammation in the body cavities as a result of the migrations of the larvae may occur, but the symptoms manifested by the animal are not diagnostic. It is hardly possible to recognize the disease in the living animal, and if we could, the treatment would not differ from that recommended in peritonitis and pleurisy. The larvæ of the Tænia marginata is not of as much economic importance as the larvae of the Tænia solium. It does not cause as serious a line of symptoms in its host as the cysticercus, and does not infect man.—(Ind. B. 100.)

TRICHINOSIS.

Trichinosis is a disease occurring in man and other animals as a result of eating flesh containing the living larvae of a parasite, *Trichinella spiralis,* commonly known as trichinæ.

These larvæ have been found encysted in the muscles of many different kinds of mammals, most frequently those of omnivorous or carnivorous habits. The occurrence of trichinæ in herbivorous mammals, or in those which do not normally eat meat, is very rare, and results only when, abandoning their usual food habits, or accidentally, these animals eat meat which happens to be infested with the parasite, or when as a matter of experiment they are purposely fed such meat. From the standpoint of public health, the only animals which are of importance in this country as sources of infection and propagators of the disease are hogs and rats. Man becomes infected through eating trichinous pork, hogs become trichinous by eating the trichinous flesh of other hogs or of rats, and rats acquire the parasite by eating the flesh of trichinous hogs or by eating other rats which happen to be infested. The country slaughterhouses where hogs are commonly kept and fed on the offal of slaughtered animals and where rats usually abound are one of the most important factors, if not the most important, in the propagation of infection.

Life History and Description.—Three stages may be distinguished in the life history of the parasite—the adult, the embryo, and the encysted larva.

In the adult stage the parasites are small, slender worms, gradually increasing in thickness toward the posterior end, and scarcely visible to the naked eye. This stage of the parasite lives in the intestine and develops from larvæ swallowed in infested meat. The cysts surrounding the larvæ are destroyed by the action of the gastric juices, and the larvæ, passing from the stomach into the intestine, grow to maturity in about two days, and, according to their sex, become adult males or females. The male is the smaller of the two, measuring only about 1.5 mm. in length (about 1-16 of an inch), the female measuring 3 to 4 mm. in length (about 1-8 to 1-6 of an inch.)

Apart from differences in their internal anatomy, the two sexes may be distinguished by the presence of a pair of conical protuberances at the posterior end of the male, which are lacking in the female. Copulation occurs between the two sexes, and the fertilized eggs in the female develop into embryos, which finally escape from the uterus through an opening on the ventral surface located some distance in front of the middle of the body. At birth the embryos are elongated and wormlike, measuring in thickness near the middle about one two hundred and fiftieth by one four thousandth of an inch.

The embryos begin to escape from the bodies of the females into the intestine of the host about six days after infestation, and the production of embryos may continue for a month or more but abates considerably after the first few days. The adult worms usually disappear from the intestine in five or six weeks, or even sooner if the patient is affected with diarrhea. The total number of embryos which each female is able to produce has been estimated at 10,000 to 15,000.

As soon as born the embryos begin to migrate, penetrating the intestinal wall and entering the connective tissue, lymphatics, and blood vessels. They are apparently aided in their migrations by the blood current and are carried to various portions of the body, finally entering the muscles. This period of migration lasts from six to ten days. Having reached its final resting place in a muscle the embryo grows considerably, reaching a length of 0.8 to 1 mm. (about one thirtieth to one twenty-fifth of an inch) and a thickness of about one six hundredth of an inch. In the meantime as it grows the embryo coils itself into a spiral and becomes surrounded by a membranous cyst, produced by changes in the interfascicular connective tissue of the muscle, brought about in consequence of the irritating influence of the worm.

In form the trichina cyst is usually ovoid or lemonshaped, with its long axis directed parallel with the muscle fibers. The average size is about one sixtieth by one hundredth of an inch. After a time fat globules are deposited on the outside of the cyst in little masses at each pole. In seven or eight months after infestation the cysts begin to degenerate, commonly becoming calcified, and the vitality of the worms is finally destroyed.

This process of degeneration is completed usually within about two years, although cases are on record in which calcification of the cysts was still very slight as long as eleven years after infestation, and the worms were still alive.

The number of encysted larvæ which may be present in even a small piece of muscle in cases of severe infestation is very large. As many as 1,200 have been counted in a piece of muscle weighing 1 gram, which would make about 500,000 in a pound. If a person were to eat a pound of pork thus heavily infested, and if all of the larvæ developed to maturity in his intestine, and if each female produced the estimated number of 10,000 embryos, there would be set free in the intestine 2,500,000,000 to 3,000,000,000 embryos. Of course, in an actual case not all of the larvæ would develop, and not every female would produce as many embryos as assumed in the estimate, nor would all the embryos succeed in penetrating the intestinal wall and migrating into the muscles. The computation, however, gives an idea of the great intensity which infestation may reach. The number of cysts present in the bodies of persons who have died with the disease has been estimated in various cases at from 5,000,000 to 100,000,000.

Drawing Blood From Tails of Hyperimmunized Hogs. B. A. I. 1910.

Hogs Rooting in a Manure Pile in a Hog Yard Adjacent to a Cow Stable. Year Book, 1908. (Some of Cows Confined in Stable are Infected with Tuberculosis. Cows Are Not Permitted to Enter Hog Yard and Hogs Are Not Permitted to Enter Cow Stable. More Than Half the Hogs That Remain in Hog Yard Six Months Contract Tuberculosis.)

Symptoms of Trichinosis.—The severity of the symptoms of trichinosis depends upon the number of living larval worms taken into the body. Three periods in the course of the disease are commonly distinguished. The first period begins in from two days to a week, sometimes not for nearly two weeks after infestation. The symptoms appearing in this stage are those of gastro-intestinal irritation, due to the development of the worms in the intestine and the liberation of the embryos, and consist of lack of appetite, nausea, abdominal pains, diarrhea, and fever. These symptoms are not constant, and are often absent.

The symptoms of the second period—that corresponding to the migration of the embryos—develop between the seventh and tenth days, sometimes later. There is more or less fever, and the muscles become tense and swollen and are painful on movement or pressure. There may be pain and difficulty in chewing, swallowing, and breathing on account of the involvement of the muscles concerned in these functions.

In the third stage, following the encystment of the worms in the muscles, the patient becomes emaciated and anemic, watery swellings appear, especially in the face, the skin may itch and tingle, and eruptions sometimes appear. The duration of the symptoms as well as their intensity depends upon the degree of infestation. Trichinosis is often mistaken for typhoid fever on account of the similarity of the symptoms, and the muscular pains are sometimes taken for rheumatism.

In light cases recovery occurs in about two weeks; in severe attacks it does not begin for six weeks, and several months may elapse before the patient entirely recovers. In fatal cases death rarely occurs earlier than the second week or later than the seventh, usually between the fourth and sixth weeks, when the muscular symptoms are at their height.

The symptoms of trichinosis in hogs are similar to those in the human patient, ordinarily much less pronounced, and recovery usually follows. During the migrations of the worms into the muscles the animal moves with difficulty, the limbs are stiff, and the hind quarters sometimes seem to be paralyzed. There is soreness of the muscles, more or less diarrhea, and sometimes skin eruptions, so that hog cholera may be suspected by the layman. As a rule, however, the symptoms are so slight that the disease in hogs passes entirely unnoticed.

Treatment of Trichinosis.—If the disease is recognized early, the patient may be treated with purgatives and vermifuges to expel the worms from the intestines. There is no treatment which will affect the embryos after their migrations are begun.

Frequency of Trichinosis.—The frequency of the disease in man depends upon the frequency of infection in hogs used for food, and upon the extent to which insufficiently cooked or raw, imperfectly cured pork is eaten. Nearly a thousand cases have been placed on record or are definitely known to have occurred in this country, and a large percentage of those patients whose nationality has been ascertained were Germans. In certain States of the German Empire the custom of eating raw pork is a common one, and out of 6,329 cases which occurred in that country during the years 1881 to 1898 (as collected by Stiles), 5,456 cases occurred in States where raw pork is an established article of diet.

The frequency of trichinosis in hogs in this country, as indicated by the microscopic examination of pork for export, formerly carried on by this Bureau (not because it was considered of value as a sanitary measure, but for the purpose of meeting the requirements of foreign trade), averages from 1 to 2 per cent. In some localities the percentage is much higher than this, in others it is less, and there is more or less variation from year to year.

In spite of the prevalence of trichinosis among hogs in this country there need be no fear of infection in man if the proper precautions are taken. The danger of infection may be entirely avoided, and only avoided, if pork is not eaten until after it has been thoroughly cooked or thoroughly cured. By either of these means any trichinæ which may be present are killed and rendered harmless. Trichinous meat thus treated is perfectly fit for food and just as wholesome as non-infested meat, except in rare instances when the infestation is so severe as to cause extensive pathologic changes.

Microscopic inspection of pork (examining certain portions of the carcasses of slaughtered hogs with the microscope and condemning carcasses in which trichinæ are found), on account of the danger of overlooking the parasites in many cases when they may be present, has not proved to be an effective means of preventing trichinosis in countries where it has been employed. Although the chances of infection are greatly reduced through the condemnation of many trichinous hogs which would otherwise be placed on the market, microscopic inspection in another way favors the occurrence of trichinosis by creating a false feeling of security in the minds of the public, many persons believing themselves perfectly safe in eating raw pork if it has been inspected and passed as free from trichinæ. The experience of Germany, where a very elaborate system is in operation, with a force of inspectors variously estimated at 25,000 to 100,000, fully demonstrates the fact that microscopic inspection is not successful as a means of barring trichinous pork from market. Out of the 6,329 cases of trichinosis occurring in Germany between 1881 and 1898, 2,042 cases (over 32 per cent) have been traced by Stiles to meat which had been inspected and passed as free from trichinæ.

In numerous instances trichinous pork has been microscopically examined as many as twenty or thirty times before the parasites were found, and as it is utterly impracticable to make so many examinations, the unreliability of inspection for trichinæ should be obvious to all. Since its uselessness as a sanitary measure is evident, microscopic inspection is not included in the system of meat inspection followed in this country. Consumers should understand that the Government mark "U. S. Inspected and Passed" does not guarantee that the meat has been inspected for trichinæ. In all cases, therefore, whether pork has been inspected or not, it should be thoroughly cooked or thoroughly cured before it is used for food. —(B. A. I. Cir. 108.)

Trichinosis is a disease caused by the muscles of the body becoming infested with a very small round worm. The disease is seen in man and other mammals. It occurs in two forms in the one animal; the intestinal, which represents the adult parasite, and the muscular, which represents the larval stage of the parasite. From one to three per cent. of the pork examined contains trichina.

Description and Life History.—The adult T. spiralis is a very small worm. The male a little over one twenty-fifth of an inch long, the female about three times the length of the male. The digestive tract can be divided into a buccal opening, œsophagus, stomach, intestines, anus and cloacal slit. The genital apparatus in the male consists of testicular tube, excretory canal and genital orifice; in the female of ovaries, uterus, vagina and vulva. Internal impregnation takes place, and the eggs develop in the uterus of the female to the number of at least a thousand and are born alive. These embryonic worms within a short time after birth penetrate through the walls of the intestines and migrate through the tissues until they reach the involuntary muscles. It then enters the muscle fibre, coils itself up and rests. In about two weeks, the cyst can be seen and embryos become transformed into larvæ. The tissue in the neighborhood of the embryo, is the seat of cellular infiltration, and the muscles in the region may become swollen, and undergo more or less degenerative changes. Connective tissue forms in the region of the parasite and the cyst containing one or more larvæ, is spindle or lemon shaped. The larva is about one twenty-fifth of an inch in length. The formation of the embryos begin about the seventh day after the cysts are taken into the digestive tract. The emigrating period is prolonged to the second or third week, and the encysting period from the fourth week to the third month. After the third month degenerative changes begin in the cyst and finally involve the larvæ as well, but these changes (calcareous degeneration) may take place very slowly and not occur for a year or more. When the cyst does become calcified, danger to the infested individual is over. One ounce of the flesh of an infested pig may contain eighty-five thousand encysted worms.

Method of Infection.—Infection occurs from eating flesh containing the live larvæ of the T. spiralis. The source of the infection in swine is from eating rats. According to the investigations made by Stiles, rats around the country slaughter houses are quite generally infested with trichina, as it is rare to find the offal in country disposed of in the proper way, and rats are abundant around such places. Hogs frequently have the same opportunity as the rats to feed on offal and under such conditions infection may occur.

Symptoms.—These have been observed in experimental animals and in man. When only a few embryos migrate through the tissues, but little body disturbance is noted. The disease is characterized by two groups of symptoms one affecting the intestinal canal, the other the muscles. From the beginning of the first to the end of the second week after infection, gastro intestinal disturbances are noticed, but the symptoms are not constant. The appetite is lost, the hog is depressed, abdomen tense and the animal may vomit. Colicky pains accompanied by a diarrhœa may occur. When the parasites are present in large numbers, it may lead to a rapid death, but if only a few are present the symptoms of disease may end in this stage.

The muscular symptoms are due to the inflammation caused by the migration of the parasites. They are observed from the second to the third weeks. The pig may rub and scratch itself, symptoms resembling rheumatism occur, and the animal is stiff, sometimes paralyzed. Respirations are difficult, it can hardly masticate and swallow its food, and the voice is much changed. Oedematous tumefactions may appear in various regions and the pig loses flesh very rapidly. Pigs generally recover in about five or six weeks.

Treatment.—The treatment is preventive. The offal around slaughter houses should be disposed of in the proper way. Hogs should not be allowed to eat this refuse and if kept around abattoirs at all, should be fed grain. If the symptoms of the disease are marked and a correct diagnosis can be made, all that can be done is to destroy the animal. As this disease is communicable to man and is often followed by fatal results, only well cooked or well cured pork should be used as food. It is impossible for the parasite to survive the proper cooking or curing of the meat.—(Ind. B. 100.)

Active purgatives should be given to remove the mature worms from the digestive tract. Calomel given in large doses and repeated at intervals has been found to act better than any other drug. During the weak state the strength of the patient should be looked after, and some of the numerous beef-tea extracts would be serviceable. But the greatest of all remedies is preventive treatment. Always cook meat thoroughly before eating. A temperature of 175° F. (and this temperature should be reached at the centre of the piece of meat cooked as well as the surface) destroys these parasites. Be careful not to let hogs have access to offal or to excrement of any kind, and above all, allow no dead rats to be thrown in the pig pen, for rats are great spreaders of diseases of this nature. The practice of feeding pigs on slaughter-house offal should be absolutely condemned. Why is it not as wise to enforce strict sanitary regulations in regard to health of animals whose flesh is to be eaten, as to our own personal health?—(N. C. B. 99.)

PREVENTION OF DISEASE.

In dealing with the diseases of hogs, preventive measures must be most relied upon. The animals must be given dry and well-ventilated quarters, which must be kept clean. Contrary to common belief, hogs have some habits which raise them above other domestic animals from the standpoint of cleanliness. For example, unless compelled to do so, a hog will not sleep in its own filth. If part of the floor of the pen is raised and kept well bedded with straw, while the rest is not, all excrement will be left on the unbedded portion of the floor, and the bed itself will be always clean.

In addition to cleanliness, close attention should be given to the feed which is supplied, that nothing may be fed which will convey the germs of disease, especially tuberculosis, to the herd. If the hogs are fed milk in any form obtained from cows kept upon the same farm, the cows should be subjected to a tuberculin test, as by this means all tuberculosis milk may be kept from the hogs. If they run with the cattle of the farm a tuberculin test of all the cattle is none the less desirable. Animals dead from any disease should not be fed to the hogs until the meat has been made safe by cooking. Skim milk or refuse from a public creamery should not be fed to hogs until it has been thoroughly sterilized.

Feeding and drinking places should be clean and the water supply pure. Unless the origin is known to be uncontaminated and there has been no possibility of infection during its course, hogs should not be allowed access to any stream. Wallows should be drained out or kept filled up as much as possible. At least once a month the quarters should be disinfected with air-slaked lime or a 5 per cent solution of crude carbolic acid. These precautions will be found valuable aids in the destruction of the various animal parasites, as well as a protection from some more serious troubles. —(F. B. 205.)

Simple Sanitary Precautions.—In the successful raising of swine there are problems, other than that of feeding, which often determine success or failure. The most important of these is the preservation of the health of the swine. Wherever a considerable number of animals are gathered together the risk from disease is considerably increased. Extra precautions must then be taken to guard against disease and to keep the animals in thrifty condition. The first essential is that their quarters be kept clean and sanitary.

In purchasing swine, care should be taken that they come from herds free from transmissible diseases, that they are healthy, and have not been exposed to disease in transit. Public stock yards are liable to be infected with hog cholera; it is dangerous to bring swine from such places and put them in a healthy breeding herd. It is an excellent plan to have a quarantine pen some distance from all other swine, and so located that there is practically no danger of transmitting diseases to the herd. All recently purchased animals should be held in quarantine in such a pen for ten days, to be certain that they are free from disease, before placing them in a healthy herd.

If a disease of swine occurs in the neighborhood, keep away from these farms and do not allow anyone who has been on an infected farm to visit your herd. If your swine have access to a stream of running water and disease appears on a farm located above yours, on the same stream, remove your hogs at once, as the infection is liable to be carried by the stream. Dogs and buzzards, also, are liable to carry the infection of hog cholera and should be kept away if possible. Such measures are simple, but they are very important.

Range for Swine.—While a few swine can be raised confined in limited quarters, if such quarters are kept clean, they will do better, will keep in better health and can be grown more cheaply if they have plenty of range for pasture. It is desirable to have the pasture fenced off into suitable areas so that the hogs can be shifted from one pasture to another, not only to provide fresh pasture, but also to afford an opportunity to disinfect the pastures, either by plowing and seeding to a forage crop or by exposure to sun and weather. Nearly all cases of intestinal worms, which are rather common in swine, are contracted from infected ground, and swine can be kept free from these parasites by frequent changes of pasture.

Inexpensive Shelter-Houses.—On account of the comparatively mild climate of Virginia, swine do not need the elaborate shelter that is necessary farther north. After experience with both permanent hog houses, and small portable shelters that can be readily moved from place to place, we consider the small colony houses much superior, so far as maintaining the health of the swine is concerned, and they are also less expensive.

Bedding for swine should be scant, but of good quality. Forest leaves or corn husks make excellent bedding. Straw soon becomes ground into a dust that is irritating to the lungs and makes the pigs cough. When infected with germs it is liable to cause the chronic pneumonia, described later in this bulletin.

All hog houses should be kept clean; they should be thoroughly disinfected every two or three months and a coat of disinfecting whitewash applied.—(Va. B. 189.)

Dipping Vats.—Dipping vats are made of wood, galvanized iron, or cement. They are set in the ground at a convenient place so that there is good surface drainage away from the vat. A good size for a vat is 10 feet long on top, 8 feet long on the bottom, 1 foot wide on the bottom and 2 feet wide on top. The end where the hogs enter should be perpendicular, and the other end inclined, with cleats, so the hogs can emerge after swimming through. The entrance should be by a slide. Such a tank is very useful wherever hogs are kept in numbers, as frequent dipping tends to keep the hogs healthy and free from parasites.

For pigs and small shoats that can be readily handled, a barrel serves the purpose well; the pigs can be caught, plunged in the dip and held there the required time. Some successful swine raisers build cement bathing places or wallows for swine and keep these filled with a watery solution of some dip or disinfecting solution. If swine have wallowing holes filled with water, some of the good dips should be put in these frequently. Dips can also be applied by using a spray-pump or sprinkling-can. The hogs are closely confined in a pen and the dipping fluid sprayed upon them, scrubbing them at the same time with a stiff brush. The objection to this method is that the skin on the underside of the body and inside of the legs is not thoroughly treated.

Dips.—One of the most efficient and economical remedies, where it is necessary to treat quite a number of animals, is the lime and sulphur dip, such as is used for dipping sheep for scab. We have used the following formula:

Fresh Lime	8 pounds.
Flowers of Sulphur	24 pounds.
Water	100 gallons.

The solution is prepared as follows: Weigh the lime and sulphur carefully. Slake the lime with sufficient water to form a thick paste. Sift in the sulphur and mix well with a hoe. Put this mixture in a kettle with twenty-five or thirty gallons of water and boil for at least one hour; two hours is better. When ready for use, add sufficient water to make 100 gallons of dip. In using this dip for sheep it is allowed to settle and only the clear, orange-colored liquid is used. The sediment is rejected, as it is liable to injure the wool. In dipping swine, however, the whole mass is used. This dip should be used warm—100° to 110° Fahrenheit. In our work, where we had a steam boiler available, the lime and sulphur dip was cooked by running a steam pipe to the bottom of a barrel standing on end. It can be cooked quickly and satisfactorily in this manner. We also have a steam pipe extending along the bottom of the dipping vat to heat the dip to the required temperature. A swine raiser of the State, who used the lime and sulphur dip upon our suggestion, reports as follows: "We treated our hogs with the lime and sulphur for mange, as you directed, and the disease seems to be destroyed, as the hogs are peeling off nicely."

Other excellent remedies are the coal-tar dips. There are many of these dips on the market. They are made from the produces of the distillation of coal tar and have a variety of trade names. Creoline is one of these preparations. They are all dark-colored liquids with a strong coal-tar odor, and when mixed with water form a milky-white or slightly brownish emulsion. We have tried several kinds with excellent results, but we can not say that any one is better than the others. Practically all druggists sell these dips. We would advise using a dip made by a well-known and reliable firm. These dips should be used at the strength of one part of the dip to forty or fifty parts of water. If rain water is obtainable, it is preferable to hard water. These dips should be used warm.

Kerosene emulsion gives fairly good results, but is hardly equal to either of the preceding, judging from a limited number of tests. A formula for kerosene emulsion is as follows: Dissolve one-fourth pound hard soap, or one quart of soft soap, in two quarts of boiling water. When dissolved, add one pint of kerosene oil and emulsify by churning or pumping violently until the whole is of a creamy consistency. When ready for use add two quarts of water and use warm. Soft water should be used if possible. The animals should be thoroughly dipped or scrubbed with this emulsion.

Applying the Dip.—In treating swine for mange, it is very important that the animals be kept wet with the solution until all the scabs are thoroughly soaked through. The necks and backs of the animals should be scrubbed with a stiff brush to remove all the scabs possible, and give the remedy a good opportunity to soak in, so that it will reach and kill all the parasites. It is very important to dip or treat all the infected swine twice; the second time eight to ten days after the first. *The first dipping, if properly done, kills all parasites, but does not destroy the eggs. These will all hatch within a week and a second dipping will completely cure the disease. Always treat all animals thoroughly twice, the second time ten days after the first.* Frequently one dipping gives such good results that the owner does not think a second is necessary, but this is a mistake.

It is especially important to treat young pigs. This is best done at weaning time. If they are thoroughly treated twice and placed in clean, uninfected quarters where they will not come in contact with other mange swine, they will remain free from mange. Ointments composed of lard, or other grease, and kerosene and sulphur, are often used. Such an ointment should not contain more than one part of kerosene to four parts of lard or other grease. One pint of lard, one teacupful of kerosene oil and two teacupfuls of flowers of sulphur, thoroughly mixed, make a very good ointment for local application, but not equal to the solutions described.

It is possible that a heavy grade of crude petroleum, such as is used for dipping cattle for mange and ticks in the Southwest, would prove an efficient remedy for swine mange, but we have not had an opportunity to test it. It can be used in a dipping tank by filling the tank nearly full of water and adding a layer of two or three inches of oil. Another way is to spray the animals with a mixture of oil and water.

Cleaning the Quarters.—After dipping or treating swine, they should be placed in clean, uninfected quarters. To disinfect quarters, all litter and dirt should be thoroughly removed and scattered on land not frequented by swine. The floors, partitions and other parts should be thoroughly saturated with one of the dipping solutions described above. They are best applied by a force pump, which drives the solution into all cracks. After it is well dried, the pens should be whitewashed, care being taken to fill all cracks well. An excellent disinfecting whitewash is made as follows:

Fresh lime	25 pounds
Flowers of sulphur	15 pounds

Mix the sulphur with a little water to a paste. Add the lime and 30 gallons of water and cook for an hour. Then add water to make 50 gallons. Apply with a spray pump.—(Va. B. 189.)

Quarantine.—Whenever any animals are brought to the farm, or when animals are brought home from shows or from neighboring farms, they should be kept apart from the rest of the herd for at least three weeks. If they have been exposed to hog cholera or swine plague the diseases will be manifested within this time, and the sick animals can be treated or killed and disposed of at once.

If cholera breaks out in the neighborhood the farmer should maintain a strict quarantine against the infected herds. He should refrain from visits to farms where they are located, and should insist on requiring that his neighbors stay out of his hog lots. Visiting of all kinds at this time should be carefully restricted. Dogs, cats, crows, and buzzards are very active carriers of infection from farm to farm, and should be guarded against as far as possible.—(F. B. 205.)

Preventive treatment is recognized by all successful hog raisers as the most successful and economical method of combating disease, and it is along this line that the greatest attention should be directed. Disease is best combated by correcting the faults in breeding and feeding, by good hygienic surroundings, by ample exercise, fresh air and sunlight, clean yards and pens, and the free use of disinfectants.—(Ind. B. 100.)

MEAT INSPECTION AND TRADE REGULATION.

FEDERAL REGULATIONS.

U. S. Department of Agriculture,
Office of the Secretary,
Washington, D. C., April 1, 1908.

For the purpose of preventing the use in interstate or foreign commerce of meat and meat food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, under the authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), the following regulations are hereby prescribed for the inspection, reinspection, examination, supervision, disposition, and method and manner of handling live cattle, sheep, swine, and goats, and the carcasses and meat food products of cattle, sheep, swine and goats, for the sanitation of the establishments at which inspection is maintained, and for the transportation of meat and meat food products from one State or Territory or the District of Columbia to any other State or Territory or the District of Columbia or to any place under the jurisdiction of the United States or to any foreign country.

These regulations, for purposes of identification are designated as B. A. I. Order 150, supersede B. A. I. Order 137, dated July 25, 1906, and all amendments thereto, and shall become and be effective at once.

James Wilson,
Secretary of Agriculture.
—(B. A. I. Order 150.)

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—(B. A. I. Order 150.)

Owing to the length of the "Regulations Governing Meat Inspection" (B. A. I. Order 150) and the impracticability of its abridgement without risk of materially altering its technical and legal interpretation, we shall not include it in this work. Those who wish to obtain a copy may do so by addressing the Secretary of Agriculture, Washington, D. C.—[THE EDITOR.]

HOG TUBERCULOSIS AND MEAT INSPECTION.

The post-mortem inspection of hogs by the Bureau officials is very thorough, and is so arranged that tuberculous carcasses are quickly separated from those that are healthy. The various phases through which the hog passes after his arrival at the stock yards, where he is yarded, sold, weighed, driven to the packing house, killed, scalded, and run through the scraper, do not particularly concern us until we meet him at the point where, lying on the traveling table, his head is almost severed from the body. Here he is examined by a veterinary inspector of the Bureau, who palpates and, if necessary, incises the submaxillary glands which have been exposed by the cut just made by the butcher for removing the head. Should these glands prove to be healthy, the hog is allowed to pass down to the rail unmolested; if on the other hand these glands are seen to be tuberculous the animal is marked and is then run into a separate compartment called the retaining room, without being eviscerated. Most of the tuberculous animals are detected here at the header's bench, records showing that 93.3 per cent of the tuberculous hogs support lesions in the glands in the region of the throat.

From the header's bench the hogs which have not been tagged are sent along the rail to the gutter's bench, where another veterinary inspector is stationed, whose duties consist in examining each hog, giving special attention to the viscera. His search is not limited to the detection of tuberculosis, but he must watch for any of the diseases proscribed by the regulations of the Bureau. As there is a certain percentage of hogs that show tuberculosis in the visceral organs without giving any evidence of the same in the cervical glands, the inspector at the gutter's bench is able to detect a number of tuberculous subjects in addition to those already tagged by the veterinarian at the header's table. In this case the inspector is guided by the appearance of the lesions in the liver, spleen, lungs, or visceral glands.

Another inspector has recently been installed at the point on the line where the carcasses are split, it having been found that occasionally vertebral lesions and lesions of the serous membranes will exist, even when the visceral organs are apparently normal.

Returning to the hogs which were tagged by the inspector on the heading bench, these are passed along to the retaining room, where they are eviscerated by a separate lot of butchers, using separate tools, under the supervision of a fourth veterinary inspector. By this method the affected parts or tissues are prevented from coming in contact with the healthy meats and are passed directly from the retaining room to either the "condemned" room or to the offal tanks. In the retaining room by this time there will be many hogs on the rail that are only slightly affected with tuberculosis, and these are now beheaded, split, trimmed, and passed on to the cooling rooms.

It is not a very difficult problem to pass judgment on the carcass of a hog affected with tuberculosis when the lesions are slight on the one hand, or when they are widespread on the other. Most sanitarians are agreed to pass the former class for food, after removing the diseased parts, and to condemn the latter class. In the great majority of hogs retained by our inspectors the lesions are local, even though one or more groups of organs are affected.

The principles governing such disposal of this class of carcasses is that, there being no evidence that the tubercle bacilli have been taken up from the portal of entry to the body by the blood vessels, there could have been no scattering of such organisms through the muscular parts of the carcass, and these may therefore be eaten with impunity. It is in cases of this class that danger from the development of toxins has been suggested. This, however, has been disproved by the experiments of Eber and ourselves. The disposal of cases of generalized tuberculosis is likewise an easy matter, for it is evident that the infectious organisms have gained entrance to the blood vessels, and by this means have been conveyed to all parts of the carcass, infecting the meat more or less completely. The rendering of such carcasses in the offal tank is the only rational disposal that can be made of them.

. There are, however, other cases in which the development of disease has reached a stage which may admit some discussion as to the advisability of using the meat for food. Many tuberculous hogs are found that give no evidence of wasting, and that show on examination that the disease has not become generalized or extensive, although it has advanced beyond the point of primary glandular infection. Here the inspector must act carefully, trying to avoid the waste or loss of any meats that may be safely converted into human food, and at the same time being sure that nothing of a dangerous character is allowed to enter the cooling or cutting rooms.

If the lesions of tuberculosis in the animal under consideration are so located that they may be readily removed, a third method of disposing of the carcass may be selected. The carcass may be carefully trimmed, the tuberculous parts being consigned to the offal tank, while the trimmed meat, comprising the bulk of the edible portions of the animal, is placed in the lard-rendering tank, where it must be cooked by steam at a temperature not lower than 220° F. for not less than four hours for the extraction of the lard which it contains. This temperature, of course, is sufficient to destroy any bacilli that may possibly be present in the meat.—(B. A. I. 25th A. R.)

Kidney Worms.—Kidney worms are found both by the killing-floor inspectors and by the trichina inspectors. The former have no difficulty in discovering them with the naked eye, while now and then the microscopist finds an entire kidney worm or part of one—usually the esophagus—in examining for trichinæ.

Since it is unquestionably true that these parasites are not transmissible to man, either by means of the eggs or by the adult, and since, in addition, the ordinary methods of cooking or curing in vogue in this country would kill the worms even if they were able to develop in man, there is no reason apparent for condemning the carcass of a hog simply because a few specimens of *Sclerostoma pinguicola* have been found in it. The infected portions should, however, be cut out and tanked, both from the practical standpoint of the butcher, to render the pork more appetizing, and from the standpoint of the inspector, to prevent so far as possible a further spreading of the disease. If cases of infection which are so extensive as to alter materially the condition of the carcass are met with, they will of course be rejected both by inspectors and by packers.—(B. A. I. Cir. 153.)

GERMAN INSPECTION OF AMERICAN HOG PRODUCTS.

Consul John A. Barnes sends from Cologne, August 3, 1898, a report upon trichinæ, and adds that the health officials of Cologne recently had in their possession two sides of American bacon in which it was claimed evidences of trichinæ were found. This meat came in a shipment of twenty-five cases. The report reads:

Through the medium of a society of German foreign meat importers whose object is the protection and promotion of the German trade in meats and fat products, I learn that for the last fifteen years, beginning with the decree of 1883 prohibiting the importation of American meat, and ending with the close of last year, there were officially confirmed in the Kingdom of Prussia 3,003 reported cases of illness from trichinæ, 207 of which resulted in death. Of these total numbers, there could be traced to the eating of European meat, examined in Germany and found to be free from trichinæ, 1,242 cases of illness and 102 deaths. Thus 41.35 per cent of all the cases of illness and 49.7 per cent of all the deaths were caused by the consumption of European pork, which was examined in Germany and found to be free from trichinæ. The remaining cases could also be traced to importations of European meat, partly examined and partly not examined, and found to contain trichinæ, and yet handled by the trade.

In not one of the above 3,003 cases could it be proved that the illness was caused by the use of American salted, pickled, or tinned meat, nor by smoked sausage (imported under imperial decree of September 3, 1891). This statement holds good for all Germany. In confirmation of this fact, the society hereinbefore mentioned has issued posters wherein a reward of 1,000 marks ($238) is offered to the person who can prove that trichinæ have been transferred to human beings by the consumption of American salted or pickled pork or smoked sausage imported under the imperial decree of September 3, 1891, canceling the edict forbidding the importation.

The inspection of American meats and sausages is much more rigid than the tests for the German home products. The American product is twice inspected. Before the meat leaves the United States, I am informed that from each hog, as a whole, the inspector selects six samples or pieces, and from these pieces are taken eighteen cuts, to which is applied the miscroscopical test. When this meat reaches Germany it is again cut into eight or ten pieces; from each of these the inspector selects three samples or pieces, and from each of these samples or pieces three are taken for the microscopical test. This results in the inspection of ninety separate pieces from the American hog, while in the inspection of the German hog only eighteen pieces are tested. By this mode of inspection it can be readily seen that opportunities of discovering ten cases of trichinæ are available in the inspection of an American hog, as against two chances in the case of the German hog. When inspected, the German hog is divided into two pieces only, being severed lengthwise, from the head down the back, thus leaving the head still attached to both of the divided parts of the body.

As regards the inspection of American sausage, I learn that in this district (Cologne) three pieces are taken for inspection purposes from 2 pounds of imported sausage. Even if no trichinæ are discovered after this rigid inspection, the sausage is much injured, if not entirely ruined, for selling purposes, inasmuch as this process not only has a tendency to cause the meat to become dry and hard, but it bears plain evidence of having been subjected to an inspection, which is not a very flattering testimonial as to its worth or desirability as food. On the other hand, German sausage is subjected to no such examination since the meat is inspected as hereinbefore stated, thereby escaping the rigid and damaging process followed in the German inspection of the American sausage.

When, in 1891, the edict against sausage and pork products from America was canceled, no inspection of sausage or pickled pork was required until July 1, 1898. Since then both products are subjected to inspection. This will result in the absolute exclusion of sausage and pickled pork or boneless hams from the German market. In the case of boneless hams weighing from 2 to 3 pounds each, the cost of inspection amounts to 15 pfennigs per kilogram, or 15 marks ($3.57) per 100 kilograms of 220 English pounds. Add to this the duty of 20 marks and we will have a total cost of 35 marks, or $8.33 on 220 pounds of meat, which virutally means the prohibition of such products.

Other expedients also appear to be resorted to by self-constituted authorities in order to discourage and prevent the large consumption of American meats. There is now pending before the court at Elberfeld, a town near Cologne, a suit relating to a case of meat from America which was packed in borax. It seems that the municipality of Cologne issued, through the daily papers, a notice or warning to dealers that such meat should not be handled or sold by them, alleging its use to be detrimental to the health of the consumer. Any citizen is permitted under this order to file a complaint regarding this kind of meat. As a consequence, when the bürgermeister (mayor) issues his edict or warning, the dealers in meats are afraid to handle or sell the prohibited products; and this is done in spite of the fact that the Emperor alone has the power to prescribe the manner of packing or preparing human food.

The bürgermeister of Solingen has exercised the same power as claimed by the bürgermeister of Cologne, by indorsing and repeating this edict or warning in his district against the use of boraxed meats, and this action has resulted in bringing the case to the attention of the court of Elberfeld. The society for the protection of German trade and industry in foreign meats and fat products is contesting this question and expects to be able to prove by distinguished German professors that the use of borax for packing meats is not injurious to human life.

I am likewise informed that uninspected American hog products have been introduced into Germany from Belgium in boxes in which other regularly inspected meats had been received from America, bearing the label of microscopic inspection.

The following is a case in point: Originally, in the microscopic inspections in the United States, the certificates thereof were the same as those given for usual ante-mortem and post-mortem inspections, with the addition of a red stamp placed on the certificate, stating that the goods mentioned were microscopically inspected and found free from trichinæ. On one occasion a carload of bacon arrived at the custom-house of Aix la Chapelle, the certificate of which was without the red stamp. The custom-house officers refused to let the car enter Germany and reported the case to the buyer at Düren. This man wrote to the Antwerp firm that he refused to accept said car, because he was entitled to receive the meat regularly inspected, as required by the German laws. The seller at Antwerp replied that, in fact, the meat in question had been regularly inspected microscopically, and it was by mistake that the certificate did not bear the red stamp; that such an error happened sometimes, but that the United States consul in Antwerp would rectify the certificate if the buyer would return it for that purpose. Unfortunately for the Düren merchant, he believed this story, sent the certificate back, and received it again two or three days afterwards bearing now the red stamp. He presented this document at the custom-house at Aix la Chapelle, in order to have the carload entered into Germany, but the custom-house officer had reported first to the American consul at Antwerp, and when he learned that the consul had neither changed the certificate nor had been authorized to do so, the entrance into Germany was refused and the buyer placed under accusation of having falsified a public document. After several years, the suit terminated in the supreme court in Leipzig with a sentence of the Düren merchant to eight days' imprisonment for assisting in the falsification of a public document. The Belgian merchant, of course, could not be prosecuted in Germany.

American Hams in Germany.—Hon. John A. Barnes, United States consul at Cologne, furnished the Department of State an article from the Stadt Anzeiger, of Cologne, bearing upon the sale of American hams in Germany. The article is as follows: "The chief mayor publishes the following notice: American hams have been brought into the market which were painted with boracic acid in order to preserve them. Although they were carefully washed before being offered for sale, the meat was strongly impregnated with boracic acid and crystals of borax had formed on the bone, as was shown by the results of the chemical examination. Now, the court of correction has declared, on the basis of opinion of experts, that the boracic acid is a poison liable to injure the health of human beings. It is therefore not permitted to keep on sale or sell meat that is preserved with boracic acid, and all those who act against this order will be proceeded against according to the imperial law of May 14, 1879, touching the trade of food."

The consul states that in Germany hams are cured by what is known as the "wet process." The following ingredients are required in this process: Boracic acid, 30 per cent; nitrate of potash, 30 per cent; and common salt, 30 per cent. It would seem, therefore, as Mr. Barnes says, that "boracic acid in American meat is 'poison,' while in German product it is, we must infer, palatable and healthy."—(B. A. I. 15th A. R.)

PART III

HEALTH AND DISEASE OF POULTRY.

INSECT PARASITES.

MITES.

THE successful outcome of poultry husbandry work must of necessity depend largely upon a correct knowledge of the materials with which the husbandman has to deal. Modern times of close competition has driven from the field all kinds of haphazard work when considered from the standpoint of economy in production. The husbandman must not only undertake stock, breeds, breeding, and be well informed along the various lines of scientific feeding, but must also be prepared to meet obstacles and to overcome difficulties when they appear. Perplexities are sure to come in the poultry business. Diseases will appear and will work sad havoc unless promptly checked.

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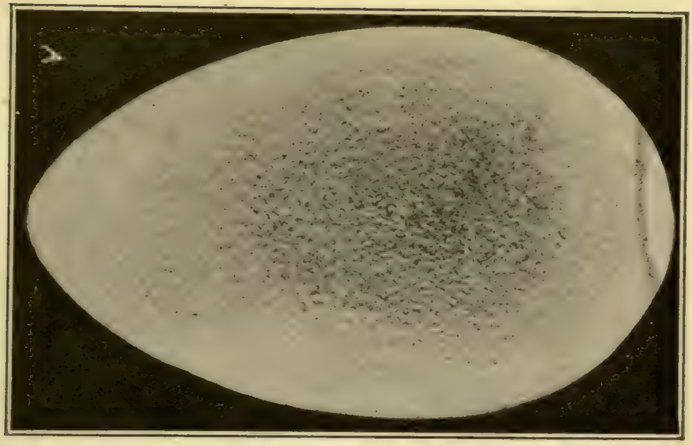
The most successful poultrymen are ever on the alert and watchful of unfavorable conditions and tendencies, and are able many times to change the conditions before really serious outbreaks occur. However, when diseases do appear it is imperative that they be met promptly with the most approved scientific treatment. The slack methods of treatment on general principles will not suffice. A disease is a specific abnormal condition and to be successfully treated must be given specific treatment to relieve the adverse conditions and permit nature to effect a cure. The following pages are prepared especially for ready reference to meet emergencies as they may arise.

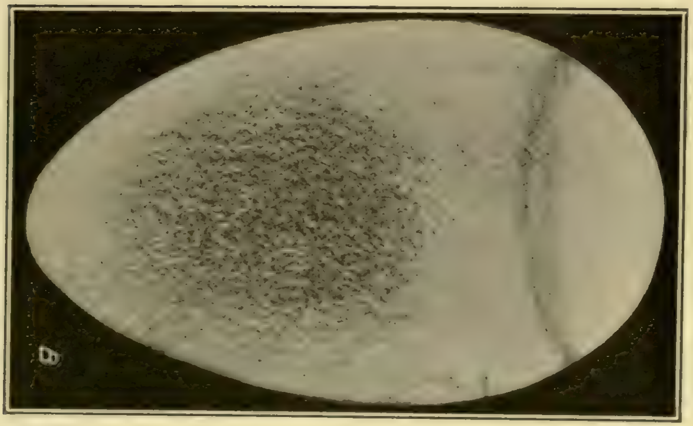
Birds are notorious as harborers of numerous species of insect pests. These insects belong to three widely separated groups, viz.: (1) the mites; (2) bird-lice; and (3) bugs and fleas.

THE CHICKEN MITE.

Bad Effects of Mite Infestation.—One of the most formidable enemies of chickens is unquestionably the chicken mite, scientifically



Fresh Egg. Dept. of Agr.



Stale, Shrunken Egg. Dept. of Agr.

called *Dermanyssus gallinae* Redi. Observations have demonstrated that chickens infested with mites are exceedingly unprofitable. The cost of keeping them is increased and the income from them is very much reduced. Indeed, when very badly infested they are totally incapacitated for performing work.

The hens will cease laying. The ovaries undergo atrophy and on autopsy will be found shrunken and in a condition unsuitable for work. In several flocks on which observations were made, it was found that egg production was greatly reduced or altogether prevented during the spring and summer when, under normal conditions it would have been at its height.

Hatching hens will often either die on the nest as a result of the mite infestation or will leave their eggs, literally driven away by the vast hordes of mites which accumulate upon them. In case of three hens which thus died upon the nest in one flock of sixteen hens, no tissue change could be found on post-mortem examination which would account for death. There was, however, an anemia, or impoverished condition of the blood, such as would be produced by the sucking of the blood by the mites. Following is an abstract from autopsy records.

Subject: Light Brahma hen found dead on the nest after sitting nearly three weeks. Skin and feathers swarming with mites. Also a few white lice, the *Menopon pallidum* Nitsch. Body in fair flesh. The digestive tract was almost empty; some oats in the crop; a small amount of hard, dry, feces in ceca. In each cecum were found about a dozen worms which were identified as the *Heterakis papillosa* Bloch, one of the round worms of the chicken, but these were not in sufficient number to exert any harmful effect. The blood was impoverished, a condition accounted for by the sucking of the blood by the mites. All the organs were normal so far as could be determined by the naked eye. Death could be accounted for only by the mite infestation.

Another very important feature of the evil effects of mites is the injury they do to newborn chicks. If the hen survives the ordeal to which she is subjected while hatching, the young chicks are attacked by the mites in great swarms as soon as they leave the protection of the shell, and, as a rule, the majority of them will succumb. The loss of newborn chicks from this cause has been known to reach ninety per cent.

Chickens, both old and young, will become reduced in flesh and lose the energy for hunting and scratching which is so necessary to their welfare. Their feathers will become roughened and drop out, the head will become pale and the chicken in every way present an unthrifty and unhealthy appearance. Broilers which are being prepared for market will not thrive well and will turn out in the end to be unprofitable, in fact a loss to the owner. In addition to the sucking of blood the mites further reduce the vitality of the fowls by biting them and disturbing their rest at night. They require more food and are at the same time incapable of converting it into tissue and energy as would be done by a healthy fowl.

Description of the Mite.—The chicken mite is commonly considered a form of insect life, although it is not, properly speaking, an insect. It is sometimes called the chicken tick or poultry tick. It would probably be better to apply the term tick to this parasite and reserve the word mite for the true itch mite of chickens, the *Sarcoptes mutans* Robin and Lanquetin. The mite has an average length of one-twenty-fifth of an inch and its width is about four-fifths of its length. It has eight legs by means of which it can move very rapidly from place to place. In color it is light gray with small dark spots showing through the skin. About one in fifty or one hundred shows a distinctly red color, varying from a light to a dark red. This red color is due to engorgement with blood. The common white louse of the hen, *Menopon pallidum* Nitsch, is longer than the mite and of a yellowish-white color.

The mites are of peculiar and stealthy habits of life, rather unlike that which one naturally expects from a parasite. Indeed, they are only semi-parasitic, and, as a rule, remain upon the fowl only long enough to secure a meal. They are very active in their movements and seem to be ever on the lookout for a victim. On account of their vigorous and vicious habits they may be styled the wolves of the insect parasites of fowls. The mites hide in crevices and under objects in the henhouse during the daytime while the chickens are outside and lie in wait for their return. They lay their eggs and the young are hatched in these hiding places. A barrel affords an excellent hiding and breeding-place as the mites lodge between the staves and under the hoops. In the nests they are to be found under the straw or other nesting material. It is a noteworthy fact that a place which shows only a few mites on the surface may contain vast numbers in the crevices or under objects. Often they become so plentiful that they overflow the hiding-places and appear in hordes upon the exposed surfaces. They have been observed so thickly settled as to cover the upper edge of an inch board and down the sides for a distance of two inches throughout four feet of its length and at the same time in almost as great numbers in neighboring places. On one occasion when the upper border of the nest box was covered by mites as above described a hen went upon the nest to lay. Within ten minutes three-fourths of the mites had left their position on the box. On lifting off the hen and examining her, she was found to be swarming with mites.

Introduction of Mites Into a Flock.—There is no doubt that mites may be carried from one premises to another upon all sorts of intermediate bearers. To provide against infection of a flock in this manner any new fowls which are brought in from infected premises should be quarantined and treated by dusting with pyrethrum powder until all the mites have been destroyed.

Extermination of Chicken Mites.—The best remedy against the chicken mite is to spray with kerosene emulsion. The emulsion is made as follows: Take one-half pound of hard soap and shave it into a gallon of *soft* water and put it on the fire and bring it to a boil. By this time the soap will have dissolved. Then remove the soap solution from the fire and stir into it at once, while hot, two gallons of kerosene. This will make a thick creamy emulsion which is made ready for use by diluting with ten volumes of *soft* water and stirring well. It can be utilized as a spray, dip or wash. It is necessary to use soft water, for hard water decomposes the soap and destroys its emulsifying power.

Make up as much of the stock emulsion as it is thought will be needed. This can be kept in a suitable vessel and a portion taken out and diluted as needed. If the bucket or holder attached to the spray pump holds five gallons, one-half gallon of the stock emulsion should be taken and put into the bucket or holder and four and one-half gallons of soft water added and the whole well stirred. It is then ready to be sprayed on the places occupied by the mites. These three sprayings done in one day and in rapid succession will destroy nearly all of the mites, but, as my researches have shown, many eggs are left in places untouched by the spray. If mites are seen crawling about the building the next day, it should be sprayed again. One might ordinarily suppose that he had now exterminated the mites. But such is not the case, for, in about three days, a crop of young mites will be found hatched from the eggs which escaped the first spraying. If these would be allowed to go undisturbed, it would not be long until the building would be as badly infested as at the beginning. Therefore the spraying should be repeated once every three or four days, spraying two or three times on each occasion, for about two weeks. The spray should be applied to every part of the building that is likely to contain the mites. In a two-story building they will crawl up the post and find lodgement upon the second floor even if chickens do not go there. In one case a colony of mites was found on the outside of a small door in the second story of the stable in which chickens are kept and which was badly infested with mites. If such a lodging-place is overlooked, the mites will not be exterminated. The procedure just described will with very little doubt be effective in ridding a place of mites, but it is advised that a constant watch be kept and the spraying repeated when mites are seen at any subsequent time. It is not necessary nor advisable to exclude the chickens from their regular coop while the process of extermination is going on except while the spraying is in progress. If the chickens are deprived of their regular quarters, they will be compelled to select temporary quarters which will soon be as badly infested with mites as the old through multiplication of the mites which are carried upon the bodies of the fowls. If the chickens are not required to make a new roosting-place, the mites which are carried out by them will either drop off upon the ground and perish or will crawl off into the crevices about the roost and be killed by subsequent sprayings. Extermination of the mites may be hastened by dusting the fowls with pyrethrum powder after they have gone to roost on the evening before the first spraying. The powder will drive the mites from the birds, and, as a result, but very few will be carried out the next day upon their bodies.—(Ia. B. 69.)

Feather-Pulling Itch Mite—One of the most common and troublesome diseases of the poultry-yard is "feather-pulling" and an unreasonable shedding of plumage. The real cause of this trouble is a very small mite, *Sarcoptes lævis, var., gallinæ,* which gets into the lower part of the quill or root of the feather. These mites often fill up the root entirely, causing the feather to become dry and brittle and break off at the surface of the skin. The shedding of feathers from this cause can always be distinguished from natural moulting by the fact that in this case the feather breaks off. The itching caused by the mites induce the fowls to help each other by pulling out the infested feathers, hence the often-described affection, "feather-pulling." The disease is highly contagious, and when a bird infested by these mites is introduced into a healthy flock the parasites are soon conveyed to every member of the flock.

Treatment.—The arsenical wash, or lard, sulphur and carbolic ointment, well rubbed in, will suffice. "Schleg's Solution" may be used with good results. This is composed of white arsenic and potassium carbonate, each 1 drachm, 3 pints of water and 3 pints of vinegar. To prevent the disease spreading, remove the cock until the danger is over.—(N. C. B. 131.)

LICE AND TICKS.

The various species of lice affecting poultry are more numerous than the mites, but since they do not suck the blood they are less injurious.

The Common Hen Louse.—The only species found in abundance throughout the country is known as *Menopon pallidum* Nitzsch, the common "hen louse." This is pale dull yellow in color, with more or less distinct darker marks on each side of the body, although often after feeding it is reddish, or pinkish in color. The length is about one-twentieth of an inch, the legs are six in number, and the head is broad, rounded in front, with a small antenna or feeler on each side. It is always without wings.

This louse is very active, and seems to wander continually over the skin or among the feathers, apparently looking for something new, as any person will discover who handles a lousy hen. The eggs, or "nits," of this louse are tiny, elongate, oval objects, with the smaller end flattened and the larger end attached to the vanes and barbs of the feathers. If conditions are favorable, the young issue from the egg in about eight days, but they may be kept in a cool place for several months without loss of vitality. The young louse is much like the parent, having six legs and a broad head, but with a rather smaller body. It keeps close to the body of the host, molts several times, and in the course of two or three weeks, if not disturbed, will reach maturity. Lice are not provided with mandibles fitted to suck blood from a hen, but they use their short-toothed jaws to bite off the epidermal scales, or dandruff, and the edges of the feathers. The claws of the feet are sometimes very sharp, and continual pricking of the host draws blood, which is greedily eaten by the lice. This accounts for the reddish color of many specimens.

Dampness, filth, and warm weather favor the increase of these lice, and a setting hen in a foul nest is their paradise. At night they crawl about on the roosts, going from one fowl to another, so that one infested bird will soon cause the infestation of an entire flock.

The chickens do not suffer from loss of blood, but from the nervous exhaustion induced by the biting of their scales and the scratching and pricking from the claws, often resulting in sores or ulcerations. The continual worry and loss of sleep produce debility and bowel troubles. Little chickens are, of course, more susceptible and often die from the attacks. Unlike mites, lice are usually confined to one kind of host, and the lice on ducks, geese, and pigeons are of kinds different from those on chickens.

Remedies.—Many people who keep a few hens consider the infestation by lice a natural state of affairs, and so long as the lice are not so excessively numerous as to interfere seriously in egg production no attempts are made to exterminate them. Lice, however, are readily killed by a number of substances, although there is more or less difficulty in getting at them. Hidden among the feathers or close against the body the parasites are secure against any remedy unless it be applied very thoroughly. Moreover, one application is not enough. What will kill the lice may not affect the eggs or "nits," so it is necessary to repeat within a few days any method of treatment that may be used.

Carbolic acid, tobacco, sulphur, naphthaline, or any oily substance will kill the lice if it touches them. Carbolic acid must be handled with great care, for it is a burning poison. It is used mixed with lime or kerosene. To make the lime mixture, stir 2 ounces of 90 per cent carbolic acid in 1 pint of cold water, sprinkle it in a half bushel of lime, and leave the lime to air slake. This can be sprinkled anywhere about the henhouse, but is most effective if put in the nests and mixed with the dust in the "wallow." If kerosene is used, take 2 ounces of carbolic acid to 1 gallon of kerosene, stir it thoroughly, and paint the mixture upon the roosts and nests, keeping the poultry out of the house until the mixture is dry.

Tobacco is used as an infusion, made by pouring hot water on tobacco stems. The hens are dipped into the liquid thus made. This is not a pleasant method to practice, and care should be taken to prevent the fowls from taking cold. Tobacco dust is the basis of various powders which are advertised to be used against lice. Their value depends largely upon the strength and freshness of the components. They are often used successfully, although frequently they are expensive.

Sulphur mixed with air-slaked lime, 10 pounds of sulphur to a half bushel of lime, is also often used against lice. This may be scattered everywhere in the house, or mixed in the dust wallow. Sulphur can also be used in fumigation. To avoid danger from fire, the sulphur or sulphur candle should be put on an old tin can or something similar, and this placed in the middle of a pan of wet ashes or earth. Light the candle and shut the house tightly for several hours; then air it well before allowing the hens to enter.

Kerosene may be used in conjunction with naphthaline. Dissolve in kerosene all the flake naphthaline it will take, and paint the roosts and nests with this saturated solution every week or so for a few months. Sawdust wet with this liquid may be placed in the nest, but should be put beneath the straw, so that the eggs will not rest upon it. Naphthaline is not poisonous, however, and may be handled without danger.—(Agr. Dep. Bu. Ent. Cir. 92.)

Other Lice on Poultry.—Chickens are subject to the attacks of various other lice with habits similar to those of the species mentioned, but most of them are not common. One, *Monopon biseriatum* Piaget, is very like the common "hen louse," but larger, and with a more elongate body. Others belong to the genera Lipeurus Goniodes and Goniocotes. Several of these are known as "gray sucker lice." They do not move around as much as the Menopons and are often confined to one part of the body. Sometimes they bury their heads in the scales of the skin or close to the base of a feather and remain a long time in one position. The species of Lipeurus are more slender than the common lice, and the Goniodes and Goniocotes are broader, with more prominent feelers or antennæ, and with darker spots on the borders of the body. The remedies used against the common hen louse will at the same time destroy any of these other lice that happen to be present.—(Dep. Agr. Bu. Ent. Cir. 92.)

The Chicken Tick.—Next to man the chicken is probably more parasitized than any of the domesticated animals. While none of the species which infest it are hard to control if due diligence is exercised, the fact remains that thousands of chickens die annually from the invasion of one or another parasite, or, if they are not killed, are reduced to such a condition as to render them wholly unprofitable. This is true not only of the internal but also of the external parasites. Everyone who has kept chickens has probably had some experience with gapeworms, and know how difficult it is to rid the flock of them and how very fatal they are to young chicks. The same may be said of intestinal worms. While the symptoms are not so apparent in this latter form of parasitic disease, the death rate is often as high, especially where the true condition is not detected. With the external parasite there is probably no chicken raiser who has not had some experience, usually a bitter one; for wherever there is a flock, there are bound to be lice, and it will depend entirely upon the energy of the owner whether the insects increase or are kept down to a point where they can do no appreciable damage.

Of the external parasites there are two kinds—the ones which eat the feathers, known technically as Mallophaga; and the blood-suckers, part of which belong to the Arachnida and others to the Insecta. If the chickens are provided with a good dusting place they will themselves take care of the feather-eating varieties; but those infested with blood-sucking parasites must be assisted, and it is only by the continual application of the most approved remedies that the insects can be kept under control. If they are not controlled, the birds are soon reduced to such a condition of poverty that they cease to lay, and, in the case of young birds, the growth is retarded to such an extent that they never become fully developed; furthermore, they remain weak, and easily succumb to the mild forms of bacterial disease. The blood-sucking parasites are periodic in their attacks; they do not live entirely on the bird, for after they have engorged themselves they leave the chickens and hide in the cracks and crevices of the houses; for which reason a lathed and plastered house is the best, as it affords no hiding place for the parasites. Where this is not to be obtained, the next best thing must be used and the efforts against the parasites increased.

Of the blood-sucking parasites, probably none are so harmful as the *Argas americanus,* more commonly known as the chicken tick. It is an inhabitant of tropical America and is gradually extending northward. At the present time it is reported from various parts of Texas as causing considerable loss to poultry raisers of that State. It is usually about a quarter of an inch long. As a rule, the parasites are very flat, unless they have recently fed; in the latter event they assume a more rounded form. It will be noticed that the head of the animal is entirely covered by the body. A hand lens or an examination of the colored plate will show the back of the tick to be covered with small pits which have an elevated margin, and have a tendency to a symmetrical arrangement, but very often a large pit on one side is represented by two or more small ones on the other. The adults have four pairs of legs, but the young forms have only three.

The parasite was first described by Packard in the Sixth Annual Report of the United States Geological Survey of the Territories for 1872. When not engorged with blood they are very flat, which enables them to creep into very small cracks in boards and walls, a fact which makes them very difficult to reach and emphasizes the necessity of very thorough application of whatever means is adopted for their eradication. They are nocturnal in their habits and are capable of living a long time without nourishment.

Of the remedies which have been used against the external parasites of chickens, none have proved so effectual as lime, alone or in combination with other agents, such as carbolic acid, sulphur, or corrosive sublimate. The method of making whitewash is too well known to give description; it may be applied hot or cold, but its efficacy is increased by its being applied hot. A good carbolic acid and lime mixture may be made by mixing 1½ pounds of lime and one-quarter pound 100 per cent straw-colored carbolic acid to each gallon of water. Corrosive sublimate is sometimes used in place of carbolic acid but, on account of its poisonous properties, it is not to be recommended. The various lime-wash mixtures are usually applied with a brush, but where the area to be covered is very large it may be used with a force pump. Whichever method is adopted, care must be taken to fill all the cracks and crevices of the houses. As the pests against which the treatment is directed have a habit of falling to the floor when disturbed, the floor also must be saturated with the mixture; where the floor is a wooden one it should be scrubbed with the wash. This treatment should be repeated every week when the houses are old and afford good hiding places for the parasites, especially as the *Argas americanus,* during its early stages, lives entirely upon the chickens. If whitewashing is neglected the young ticks upon leaving the birds to live in the woodwork will form new colonies. Dipping has been suggested as a means of ridding chickens of external parasites, but this method of treatment has often been followed by unfavorable results.—(Agr. Dep. Bu. An. Ind. 16th An. Rept.)

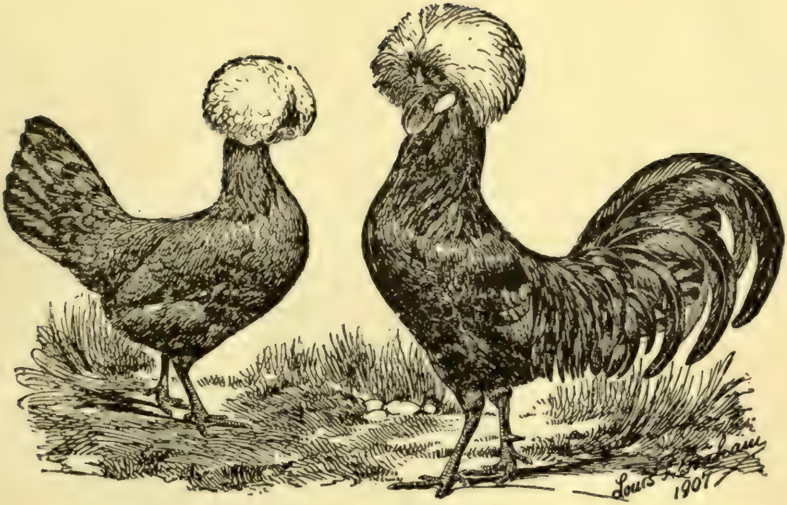
The Nest Bug.—This is the most troublesome insect parasite of poultry. It is a sister and smaller species to the too well-known bed-bug—*Acanthia lectularia.* It belongs to the Hemiptera or true bugs. This parasite, *Acanthia columbiaria,* has a long and sharp beak with which it punctures the skin and sucks its host's blood. It is most common in nests, especially the nests of sitting hens, upon whom it inflicts such cruel torments that the birds are frequently compelled to abandon the unhatched brood.

Remedy.—The nest boxes of laying hens (in hot weather especially) should be thoroughly washed or sprayed with kerosene emulsion, or pure kerosene, and whitewashed in and outside at least once per month, the old straw or other nesting material burned equally as often. A liberal dusting of the fowls with insect powder or tobacco dust is very efficacious, and to a certain extent keeps the pests at bay. The nests and boxes of sitting hens should receive same treatment with each successive hatch, and the hens themselves should be dusted at least twice during incubation. Do not use grease or oil of any description on the bodies or feathers of sitters, as the least trace upon the eggs destroys the germ.

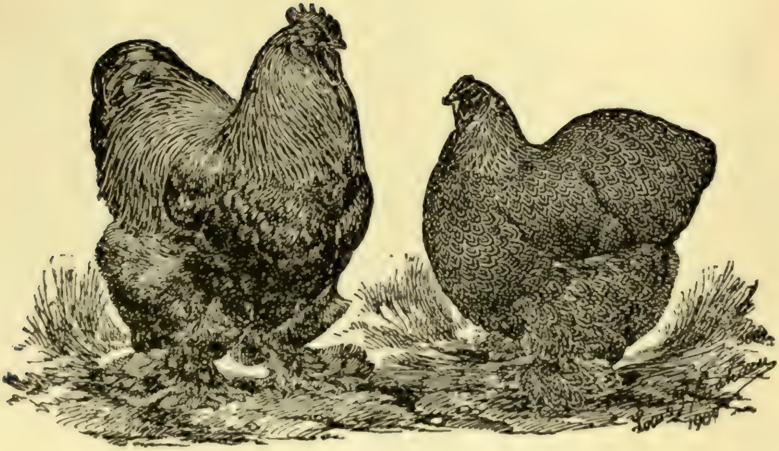
The Bird Flea.—The bird flea, *Pulex avium,* Tg., is more or less common among birds everywhere, but is especially common on the pigeon. It is a slender reddish insect, without spines on head, but shows 24 or 26 on hind edge of next sedgment.

Treatment.—Thoroughly cleanse all houses or coops where fowls roost, and with a sprayer, sprinkler or brush put kerosene emulsion or pure kerosene over the entire inside surface, into all cracks and over all roosts. Dust the fowls affected with insect powder, and grease slightly under vent and on heads with same treatment as suggested in previous article. Always have at the fowl's disposal a good dust bath.—(N. C. B. 131.)

Gapes.—This disease attacks a number of domesticated birds, especially pheasants, fowls, turkeys and peacocks. It is also known to affect the gray partridge, magpie hooded crow, green wood pecker, sparrow, robin, and martin. It was first reported in the United States by Wiesenthal, near Baltimore, where it caused an epidemic in fowls and turkeys. Montague observed it in England in 1806, where it occurred in pullets, pheasants, and partridges. Since then it has been commonly found in America, England, France, Germany and Italy. In England the disease is estimated to destroy 500,000 fowls annually.



Pair of White Crested Black Polish. Dept. of Agr.



Pair of Partridge Cochins. Dept. of Agr.

Symptoms.—The disease is characterized by a quick whistling cough, simulating a sneeze. Affected birds yawn frequently, and open the beak, at the same time stretching the neck as if in the effort to expel something from the throat. In certain cases the mouth is filled with a foamy saliva which obstructs the breathing. In young birds there are general signs of prostration, *i. e.,* diminished appetite, dullness, roughened plumage, etc.

Diagnosis.—If the trachea of a bird affected with gapes be opened a number, 1 to 30, of reddish forked worms about one-half an inch in length will be found attached to the membrane, and embedded in a frothy mucus. Each of these forked worms is a pair, male and female in union, the larger portion being the female, and the smaller the male. They are firmly attached by a disk shaped sucking mouth by means of which they draw blood from the affected bird.

The points to which the worms are attached are sometimes swollen into a small tumor containing a cheesy pus. These abscesses may become so large as to close the trachea and cause suffocation; or their mere presence in considerable numbers by obstructing this air passage may produce the same result. Their continual presence is a source of irritation, which in young birds exhausts their strength, and may lead to death, although old birds may harbor the parasite and recover.

Propagation and Control.—If the worms found in the trachea of affected birds be examined, they will be found to vary in size and degrees of development. The larger females are greatly swollen and filled with eggs. These impregnated female worms are coughed up by the affected birds, and their eggs escape by the death and decay of the parent. Since each female produces thousands of eggs, it is easy to see how the ground over which sick fowls are allowed to run may become badly infested. The eggs develop in damp soil, in watering cups, etc., or they may be taken into the body of the bird and undergo their metamorphosis within the host.

Walker observed that the embryos remain alive in the digestive canal of earth worms, and that when birds swallow the latter they become affected with gapes. From what has been said it is easy to see that one infected bird may easily contaminate the ground over which it runs, so that the first requisite in controlling the trouble is to separate the sick from the well. *Chicks affected with gapes should not be allowed to run with the healthy.* They should be placed in a room having a clean dry floor, and this should be disinfected every few days by wetting the floor with a 5 per cent solution of crude carbolic acid. The bodies of dead birds should either be burned or deeply buried. The drinking cups should be disinfected with the same solution, and then washed with clean water; also add 2 or 3 drachms of salicilate of soda per quart to the drinking water.

For the protection of the well, if there is reason to believe that the ground of the poultry yards is infested with the worms, or their eggs or embryos, sprinkle the latter with a one per cent solution of sulphuric acid, also keep the watering cups disinfected and use salicylate of soda in the drinking water as above directed. As soon as a bird is found to be affected, immediately place it in the quarantine room as already provided.

Treatment.—It is doubtful whether medicinal treatment is necessary if the aforegoing precautions are observed. However, it is human nature to endeavor to save the life of a sick animal especially if it has a money value. Garlic or onion is one of the oldest and best known remedies. This may be chopped up fine, mixed with the food and given to the affected chicks. Montague gave infusions of either garlic or rue for the birds to drink instead of water. He was also successful in the use of powdered asafoetida with an equal part of powdered gentian made into pills of about 8 grains, one being given per head every day. The most successful remedy found by Theobald was the injection directly into the trachea with a small medicine dropper of a few drops of an 8 per cent solution of salicylate of soda or eucalyptus oil. Large numbers of chicks can be successfully treated by placing them in a closed box into which is blown a mixture of one ounce of powdered chalk and half an ounce of finely ground camphor, so that the birds must inhale it. Theobald found this the safest and most successful remedy.—(Del. B. 47.)

Chicks on a Plank Floor.—By experiment it is shown to be possible to prevent the trouble completely by keeping chicks on a board floor from the time they are hatched until they are large enough to endure the attacks of the worms. The result of value to the farmer obtained from this preliminary experiment is, that keeping chicks, for several weeks after they hatch, on a plank floor will prevent the gapes.—(Ky. Station 10th Ann. Report.)

BACILLARY WHITE DIARRHEA.

The disease of young chicks commonly known as white diarrhea is caused by a specific organism—*Bacterium pullorum.** This bacillus was first isolated by Rettger in 1899. The mother hen is the original source of infection, the specific organism being present in the ovary. Consequently the organism is to be found in the yolks of a certain proportion of the eggs produced by infected hens, and chicks from such eggs have the disease when hatched.

Normal chicks may contract the disease by taking the organism into the digestive tract, as demonstrated by experiments with artificially infected food. Therefore, infected chicks probably transmit the disease to normal chicks through the infected droppings.

Infection through the food supply takes place at an early age, in all probability within the first three or four days after hatching.

Symptoms and Post-Mortem Appearances.—As in many other diseases, the symptoms may vary within certain limits in the individuals affected. It is not to be understood that all of the following symptoms will be observed in every chick suffering from bacillary white diarrhea; but almost all of them will be apparent in epidemics of any considerable size.

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*Brief description of Bacterium pullorum. The organism is a long, slender bacillus (.3-.5 x 1-2.5 micra) with slightly rounded ends. It usually occurs single, chains of more than two bacilli being rarely found. It is non-motile, non-liquefying, non-chromogenic and facultatively anaerobic. In its microscopic appearances it resembles the bacillus of typhoid fever. It is stained readily by the ordinary basic anilin dyes. It does not stain by the Gram method; neither does it retain its color when treated with dilute acetic and mineral acids. The organism does not produce spores, or at least they have never been observed.

The earliest deaths may occur within a very short time after hatching, without any prominent symptoms, excepting perhaps, weakness and lack of vitality. The characteristic whitish discharge from the vent soon makes its appearance in the flock, the time depending, without doubt, upon the virulence of the organism and the mode of infection. The discharge may be slight or profuse, in color white or creamy, sometimes mixed with brown. The voided matter has a more or less sticky or glairy character. It may simply streak the down below the vent or may cling to the down in sufficient quantity to seal up the vent. This is the condition that poultrymen designate as pasting up behind. This latter condition, however, is not necessarily indicative of white diarrhea.

The chicks soon become listless and sleepy, inclined to huddle together and remain under the hover much of the time. They seem to lose appetite and do not eat much. Frequently when they attempt to take food their action is more or less mechanical. The wings begin to droop or project slightly from the body, with feathers ruffled. In acute cases the eyes are closed and the chicks become indifferent to everything that goes on about them. Many of the chicks peep or chirp constantly, the sound being shrill or weak according to the strength of the individual. Frequently when endeavoring to void the excreta the chicks utter a shrill twitter, apparently a cry of pain. The breathing may be labored, the abdomen heaving with each breath. Occasionally one may note a certain amount of gasping or gaping.

During the progress of the disease the chick may die suddenly while still fairly strong. When the disease is prolonged the chicks gradually waste away, becoming weaker and weaker until they are scarcely able to support their own weight. In this stage they will often be seen to rest against foreign objects for support, standing with legs braced apart, squatting or lying utterly helpless.

Woods accurately describes the conditions as follows: The weakling is almost always big-bellied, the abdomen protruding to the rear so that it bunches out behind, well out of line with the vent, with the result that the chick looks as if the tail-piece and backbone had been pushed forward and in just above the vent. With few exceptions, the deaths from typical bacillary white diarrhea occur while the chicks are under one month of age. After this a few straggling deaths may be expected, and if complications set in, a high mortality may be observed. The chicks which have had bacillary white diarrhea seem to be greatly weakened in constitution, and fall an easy prey to disorders which would be resisted easily by normal chicks.

Those which survive remain more or less stunted in their development. Frequently they are misshapen, with long beaks and crow heads and with imperfect feathering. In every way they impress one as being weak and lacking in vitality. This condition may persist indefinitely, or the bird may slowly regain vigor and vitality and finally make fairly satisfactory development. The usual method of autopsy has been followed here, the bird being placed on its back on a board, the outstretched wings and the legs tacked in position, the skin covering the breast and abdomen removed and the internal organs exposed to view by the removal of the entire breast bone. In typical cases the following conditions are found: Crop, empty or partially filled with slimy fluid or with food; lungs, apparently normal (tubercles not observed); liver, pale, with streaks and patches of red. The congested areas are usually large in size. Occasionally epidemics will be met with in which the liver is more or less congested throughout. In such cases the portion of the stomach lying in contact with the liver is inflamed; kidney and spleen, apparently normal; intestines, pale, and for the greater part empty. A small amount of dark grayish or brownish matter frequently present; ceca, with few exceptions but partly filled with a grayish soft material. Only occasionally cheesy or firm contents; unabsorbed yolk, usually present, varying in size from a pea to a full-sized yolk. The color may vary from yellow to brownish green or nearly black. In consistency there is also much variation. It may appear perfectly normal, distinctly gelatinous, or watery. Frequently it looks like custard and again it is more or less dry and firm. Unless the chick has been dead for some time the yolk is not putrid, but merely stale. The chick as a whole appears more or less anaemic and emaciated. The muscles of the wings, breast and legs may be almost completely wasted away.

Additional Points of Practical Interest.—There are several other matters which should be brought to the attention of practical poultrymen at this time, even though there is not sufficient evidence to warrant one in making positive statements regarding them. A number of things have come up which are strongly suggestive, and which are regarded as being of such importance as to deserve further and thorough investigation. The trap nest records of individual hens, when studied in connection with the results of egg examinations, seem to indicate that infected hens are comparatively poor layers. This is especially true of those hens which are in their second and subsequent laying years. Apparently such hens lay regularly only in the spring and summer, the natural breeding season.

In order to secure further practical information on this point, an extended trip was made among poultrymen who make it a practice to raise winter chicks. In a very few cases there seemed to be evidence of white diarrhea infection, but the large majority of the men interviewed agreed that the chicks which are hatched in late fall, winter or early spring, are comparatively free from this disease. Should these early observations be fully confirmed, the selection of breeding stock which is comparatively free from infection would be greatly simplified.

The question has frequently been asked as to whether infection may spread from one hen to another, through food which has become contaminated with infected droppings. On this point there is no direct evidence, but in view of the fact that infected and noninfected hens have been kept in the same pens for many months without any apparent spreading of infection, it seems highly improbable that the organism is conveyed from adult to adult in this manner.

The question also naturally arises, may not the male bird carry the organism from one hen to another? The same course of reasoning may be followed here as in the previous instance, and although the evidence is not conclusive, it is quite probable that the organism in question is not carried in this way. Whether or not adult male birds may be infected with *Bacterium pullorum* is another matter which is still undecided.

Should the possibilities of the transmission of *Bacterium pullorum* from hen to hen, and through the agency of the male birds, be actually eliminated, there is apparently but one explanation for the presence of the organism in question in the ovaries of adult females. It has been demonstrated that chicks may have the disease when hatched, or acquire it very soon after hatching. The infected female chicks which survive the disease continue to carry the organism in their bodies, not in the various organs, as when they are young and visibly affected, but locally, as in the ovary. In other words, such chicks have become permanent bacillus carriers.

Summary.—In order to avoid possible confusion the term bacillary white diarrhea has been applied to that form of disease of young chicks which is caused by *Bacterium pullorum.* This is the disease commonly called "white diarrhea" by the poultrymen of New England. 1—The original source of infection is the ovary of the mother hen. 2—Eggs from infected hens contain the organism in the yolks. 3—Chicks produced from infected eggs have the disease when hatched. 4—The disease may be spread through the medium of infected food and water. Hence normal chicks may acquire it by picking up infected droppings or food contaminated thereby. 5—Infection from chick to chick cannot, apparently, take place after they are three or four days of age. 6—As a rule, infected chicks make less satisfactory growth than those that are apparently normal. For sometime they appear stunted and weak, but may eventually undergo more or less complete development. 7—The female chicks which survive often harbor the infection and may become bacillus carriers. Infection in the breeding pens is perpetuated in this manner. 8—In all probability infection does not pass from adult to adult. 9—Infected hens are apparently poor layers, especially in their second and subsequent laying seasons.

Practical Suggestions.—It is of the greatest importance that the poultryman learn to recognize bacillary white diarrhea, both through external symptoms and post mortem appearances of diseased chicks. The mere discharge of whitish material from the vent is not in itself proof that the chicks are affected with this specific disorder.

Infected hens should be eliminated from the breeding pens. Such elimination is made possible by pedigree, records of chicks. If the eggs from the different pens are hatched separately, and the chicks segregated for the first few days, it will soon be made apparent through the condition of the chicks, which pens contain infected hens. This may prove effectual in cases where infection has not become general. To determine which individual hens are infected, the trap nest should be used, and the same general procedure followed.

In case infection exists and it is not practicable to determine the breeders which are infected, the entire flock should be discarded for breeding purposes, and eggs for hatching secured from a non-infected farm. The disease has been eliminated in a single season by following this plan, and without any change in equipment or methods.

Another possible means of determining infection of breeding hens is the direct examination of the ovaries. It is entirely practicable to inspect these organs through an opening in the side of the bird similar to that made in caponizing. Where the abnormal condition is marked it may be easily detected. Great care should be exercised that breeding stock, young chicks, or eggs for hatching, be secured from flocks which are free from white diarrhea infection.

As to the means of preventing the spread of infection from chick to chick, segregation of chicks during the first four days after hatching should prove effective. It is entirely probable that keeping chicks in small groups in the incubator for forty-eight hours after hatching will materially reduce the chances of a few infected individuals spreading the infection through the entire hatch. For division into small groups the use of pedigree trays, wire baskets or bags made of mosquito netting is recommended. Naturally, the smaller the group the less the chance of spreading the infection. From the time the chicks begin to hatch until they are removed to the brooder, the incubator should be kept dark. This will largely prevent the chicks from picking at the droppings.

Since infected chicks make unsatisfactory development for the first few weeks, and may later regain vigor and make fair growth, it is advisable to select at an early age those intended for breeding purposes. The selection may be made when the chickens are from eight to ten weeks of age, reserving only those which show greatest vigor and development. Incubators, brooders, and all other appliances used in the hatching and rearing of the chicks should be cleaned and disinfected frequently. Food and water should be supplied in such a manner as to prevent contamination with infected droppings. The use of fine absorptive litter in the brooder, especially for the first few days, is also advisable.

The feeding of sour milk may prove very effective as a preventive measure. The milk must be fed early, or during the infection stage. After the white diarrhea organism has once entered the general circulation, such treatment is of little or no value. Hence, sour milk should not be looked upon as a cure, but merely as a possible preventive agent. Since perfect physical condition is, as a rule, a barrier to disease, it is important that the health and vigor of the breeding stock and chicks be raised and constantly preserved. Proper methods of housing, feeding, incubation, brooding, and management should therefore be employed.—(Conn. B. 68.)

Chickenpox.—Chickenpox (sore head) occurs to some extent in California, in the Gulf States, and is one of the great obstacles to successful chicken growing in Hawaii. It is characterized by superficial, wart-like tumors occurring upon the naked parts of the head. These are usually covered with a scale of exudate. Upon removal of the scab the tumor exhibits a whitish, shiny mass that cleaves readily into minute cylindrical masses arranged perpendicularly to the skin. The tumors spread rapidly from the primary focus.

When the eyelids become seriously involved they necessarily are kept closed, which results in death from starvation, when both eyes are affected. The evidence at hand indicates that the disease is usually fatal only when this occurs. Ordinarily the tumors are present two or three weeks and disappear without having caused injury. Chickenpox is readily transmissible by inoculation. The disease has been transmitted naturally to healthy chicks kept in close contact with diseased ones. It does not appear that young chicks are affected. Older fowls seem to withstand the affection better. However it has been reported in adult fowls. The greatest trouble was encountered during the excessively wet periods. As soon as the disease was detected, the fowl was isolated in a hospital and given local treatment with crude carbolic acid. Recovery occurred in a large percentage of the fowls.—(Calif. B.)

BLACKHEAD (INFECTIOUS ENTERO-HEPATITIS).

Turkey raising in some parts of this country is developing into a profitable industry. During the holiday season of the past year the local dealers state that turkeys netted the producer from 16 to 22 cents per pound, live weight. Taking this as a basis, and considering the small expenditure which turkeys require where they have access to a large range, the industry is a profitable one, providing that the fowls escape the ravages of contagious diseases.

Young turkeys are very delicate and require a great deal of care. Many of them die when very young of acute indigestion from improper feeding and from exposure to wet and cold. Such losses are frequently attributed to contagious disease, merely because many are subjected to the same conditions at the same time.

One of the most destructive diseases which has come to our notice, attacking both old and young turkeys, is Entero-Hepatitis, sometimes known as "black head." The latter term is a common one owing to a peculiar dark color which the head assumes when the disease is at its height, but this is merely a manifestation of dissease situated in some other part of its anatomy.

Entero-Hepatitis is an intestinal disease situated in the free ends of the caeca, and is caused by a parasitic protozoa named by Smith *Amoeba meleagridis;* as this is what may be termed a feeding disease, the parasite enters the body with food or drink, finally finding lodgment in the mucous membrane of the caeca or in the liver. There it multiplies and causes an inflammation which finally destroys the mucous membrane. The affected caecum is very much enlarged and filled with fecal matter sometimes giving it a dark blue-black appearance, at other times it may be filled with a yellowish slimy mass, which when ejected adheres to the feathers in the vicinity of the anus. There is no sign of disease in any other part of the digestive tract; the liver, however, is seriously affected, being about twice its normal size, dark in color and filled throughout with yellow spots varying in shape and size. But few of these spots have a definite outline, and the color varies from a mottled yellow to a dark brown, which merges into the surrounding tissue; they are flat, and sometimes depressed below the surface of the liver. Some of the larger ones, however, are raised like blisters. These spots are composed of dead liver tissue, and are the disease centers where the parasites may be found. The liver is not always affected, as birds have been dissected in which there were no other lesions except in the free ends of the caeca.

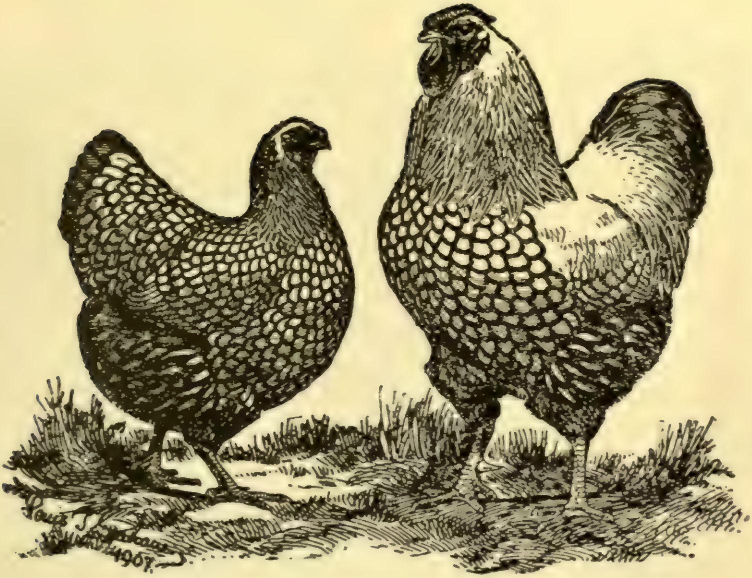
Cause of the Disease.—As before stated, this disease is caused by protozoa, animal parasites which are from one to four times as large as blood corpuscles. They can only be detected by the aid of a microscope, and slides properly prepared for it. They are more or less circular in form, and have a nucleated granular spot usually near the center. Because of their minuteness, and growth in the mucous membranes of the digestive tract, they are easily carried by the excreta to food which, upon becoming contaminated, transmits them to other fowls. This is the usual means of infection.

While they are no doubt carried by the circulatory system to all parts of the body, it is to be inferred that the caeca and liver are the principal seats of disease, but the blackening of the head which occurs at times is probably due to growths of the parasites causing thrombosis, a damming of the blood, which would indicate that they do grow elsewhere than in the liver and caeca.

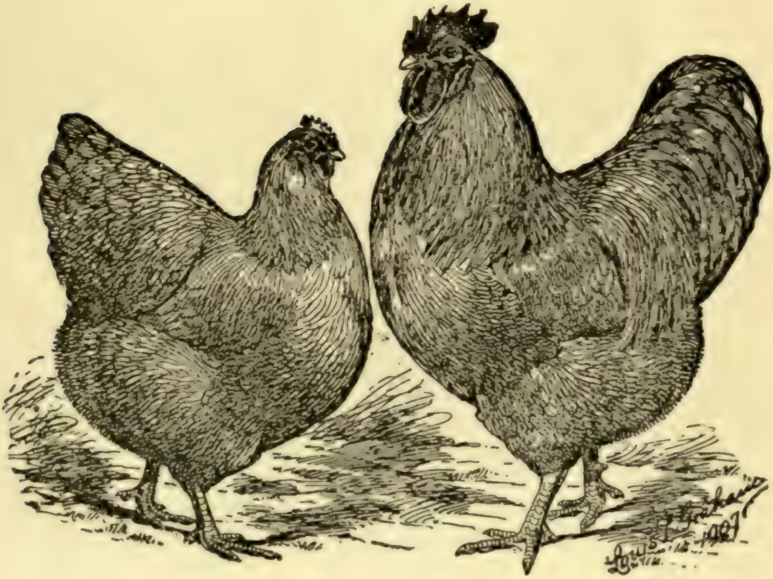
Symptoms.—The most pronounced symptom is diarrhœa which, once begun, is constant. The discharges are frequent, thin, watery and generally of a yellowish color. This, however, sometimes occurs from other intestinal disorders, such as tapeworms, or bacterial irritation, and therefore cannot alone signify that they are afflicted with this particular malady. If the affection first occurs in the caeca, diarrhœa will appear earlier than if it were in the liver, for the disease in the liver must progress to such a stage as to interfere with the gall ducts discharging the contents of the gall bladder into the intestines, thus interfering with digestion and causing diarrhœa; the next symptom is a drooping of the tail, followed by a drooping of the wings, after which death soon ensues.

If a blackening of the head occurs, by an engorgement of blood, it takes place about the time when the tail droops and usually continues until death. The affected birds have fickle appetites and mope about; in chronic cases they become emaciated, whereas in the acute form, when both liver and caeca are affected, they die before there is any appreciable wasting away.

Young turkeys are much more susceptible than are the older ones, or they may be more delicate and cannot withstand the in-



Pair of Silver Wyandottes. Dept. of Agr.



Pair of Single-Comb Buff Orpingtons. Dept. of Agr.

vasion of the parasites so well; however this may be, they succumb very readily to the disease. The symptoms are similar to those of older birds, and even more pronounced. They begin by moping and hunching up as if they were cold, diarrhœa soon sets in, the tail droops, then the wings drop and they go about uttering a pitiful "peep," after which they soon die. A blackening of the head does not always occur.

Remedies.—It has been pointed out that Entero-Hepatitis is caused by a microscopic parasite which passes with the excreta from diseased turkeys. Whether these pass a part of their life cycle outside of the living bird, is not known, nor do we know how long they will retain their vitality after expulsion. Suffice it to say that the diseased bird scatters many of them in the vicinity in which other fowls are fed; therefore the first step towards remedy is prevention. Food given to fowls should *never come in contact with their droppings.*

It is customary, especially on the farm, or in places where poultry is confined to small runs, to scatter grain to fowls where they are compelled to pick it out of their excreta. By this means bacterial diseases and intestinal parasites are passed from fowl to fowl.

There is more tuberculosis spread in this way than by all other means combined, and there are more fowls affected with tuberculosis than all other diseases combined. So it is with Entero-Hepatitis, one bird with an advanced case of the disease, will infect the feeding ground of others. It would be far better to sacrifice that bird at once than risk spreading the infection to the whole flock. This holds good with any other disease. A sick bird should be removed from the flock and placed in close quarters which may afterwards be disinfected, or the bird may be killed at once and burned. This precaution is worth many times the value of the one sacrificed. When Entero-Hepatitis once becomes established medical treatment is not very successful, owing to the difficulty of reaching the parasites at the seat of disease, yet, treating them with some of the following remedies is well worth the trouble.

Dr. Salmon has recommended Benzonaphthal—1 grain, Salicylate of Bismuth—1 grain. Hyposulphite of Sodium may be useful in doses of two to four grains, or Betel in the dose of one grain. Any of these doses should be administered twice daily for some time, to birds weighing not less than four pounds. For birds under that size the dose should be decreased proportionately.

Summary.—The most reasonable course to follow when the disease is known to exist is to separate from the flock any fowl showing the least symptom of disease. Place it where it may be treated, and if it does not respond to medicines, but continues failing, kill the bird without drawing blood and burn the carcass, then sterilize the coop where it has been kept with quick-lime, using a sufficient quantity to cover the ground. An easy way to prepare the lime, so that it can be scattered, is to place it in a box and sprinkle water on it until the lime is reduced to a dusty powder. Old air-slaked lime loses its strength and is not so good.

Instead of this, a strong whitewash may be made, and with a broom or spray wet every part of the coop and floor. Five cents' worth of lime will disinfect a good-sized coop if thoroughly applied. A solution of carbolic acid prepared by mixing 5 parts of the acid to 100 parts of water makes a good disinfecting solution and may be applied in the same manner as the whitewash, or chloride of lime, five ounces to one gallon of water is good. Corrosive sublimate (mercuric chloride) in a strength of one ounce to about eight gallons of water, is a strong disinfectant and may also be used as the preceding ones, but it is poisonous and must be handled with great care.

The habits of turkeys are peculiar. They are not so domesticated as other fowls and seem to thrive better when allowed to roam at will. They are particular and suspicious of strange food given them, making it difficult to administer medicines without confining them and using force. Considering these peculiarities, an attempt to administer medicine while they run at large or to disinfect the premises, is impracticable, but lime should be freely used on the excreta beneath where they roost and on their feeding grounds.—(Oregon B. 95.)

TUBERCULOSIS IN FOWLS.

Tuberculosis in fowls is a serious pest in Europe, but seems to be rare in America, or at least has not been frequently reported. Thus far fowl tuberculosis has been located in Oregon (by Pernot, 1900), in California (by Moore and Ward, 1903), in Canada (by Higgins, 1905), in New York (by Burnett, 1907), and in the southeastern corner of Michigan in February of this year by the Pathological Division of the Dep. of Agriculture.

The disease exists extensively among many large poultry ranches, but seldom kills enough fowls at any one time to excite the alarm of the owner. Its existence in a flock constitutes a steady drain, but it fails to attract much attention, because the losses are so evenly distributed in point of time. Tuberculosis has been observed in grown fowls only. It does not appear to occur in young chicks.

In the first outbreak of the disease brought to notice, the owner reported a loss of about two hundred and fifty fowls during a year, out of a flock of fourteen hundred. He had made a large number of post-mortem examinations, and as the alterations occurring in the disease are readily recognized, the observations have some interest.

Symptoms.—There seems to be no noticeable symptoms until the disease has progressed far enough to cause emaciation and weakness. In such cases the breast muscles are found to be wasted away and the light weight is very noticeable. Lameness often occurs, and poultrymen usually refer to such fowls as affected with "rheumatism." This conclusion is not justified, for in a number of such cases the writer has been able to find tuberculosis of the joints, which would account for the lameness. In the last stages of sickness, the affected bird crouches, apparently from weakness. The pale comb, ruffled feathers, unnatural gait, and general attitude are features that attract attention to the victims of the disease. A very small percentage of affected fowls show tuberculous nodules on the skin of various portions of the body. These may consist of single spherical masses each surrounding the root of a feather, or more often consist of larger masses. These nodules, when occurring upon the head, should not be confused with the swellings that appear on the head in advanced cases of roup (swell head), nor with the wart-like lumps found on the head in chicken-pox. Facts concerning the length of time that fowls usually live when infected have not yet been secured. One hen, inoculated by injecting crushed tuberculous liver into the abdominal cavity, died in six weeks of generalized tuberculosis.

Lesions.—In most cases the liver is affected. It is found enlarged and studded throughout with yellowish-white nodules of a more or less cheesy consistency, varying greatly in size and number in different cases. The nodules are very readily separated from the surrounding liver tissue. Poultrymen are familiar with the condition, and refer to it as "liver complaint" or as "spotted liver." The spleen, in health a small rounded purple organ about half an inch in diameter, is frequently affected with tuberculosis, and in consequence greatly enlarged. Rounded masses of varying size may be found in the walls of any part of the intestine. The mesentery, the thin membrane to the border of which the intestine is attached, is occasionally dotted with nodular masses. The lungs are very rarely affected. Alterations of the bones, joints, or other organs occur more rarely, and are not so readily recognized as the changes described. Most hens badly affected with tuberculosis are very lean, but exceptions have been observed.

Spread of Tuberculosis Among Fowls.—Tuberculosis is an infectious disease caused by organisms, known as tubercle bacteria, which gain entrance to certain organs of the body and multiply there. The nodular growths (tubercles) so constantly found in tuberculosis are caused by the presence of these bacteria in the affected regions. The spread of tuberculosis from one fowl to another occurs only when conditions permit the transfer of the live tubercle bacteria more or less directly from the diseased to the healthy. The presence of tubercular growths in the walls of the intestine and in the liver suggests that the tubercle bacteria enter the body with the food. The rarity with which tuberculosis occurs in the lungs of fowls would indicate that infection by the inhalation of tubercle bacteria occurs rarely, if at all.

An examination of the tubercular growths located along the walls of the intestine leads to the conclusion that the tubercle bacteria are liberated from the body along with the droppings. In a large percentage of bad cases of tuberculosis, tubercles will be found to have a cavity in the center which communicates with the interior of the intestine. A microscopic examination of the contents of the intestine at such points shows that enormous numbers of tubercle bacteria are present. The conclusion that they are liberated through the intestine is unavoidable. The droppings of fowls affected with tuberculosis must therefore be regarded as an important factor in the spread of the disease.

No evidence is at hand to indicate that tuberculosis is spread through the egg. Post-mortem examinations and observations upon living fowls lead to the conclusion that badly infected fowls, at least, do not lay. Considerable attention has been paid to the ailments causing the death of young chicks, but no tuberculosis has been discovered among them. The disease would be found in young stock if it were commonly transmitted to the young through the egg.

The location in which the droppings are deposited bears considerable relation to the probability of that material being a means of infecting healthy fowls. The practice of feeding soft food from the ground affords the best of opportunity for the contamination of the food with fresh droppings. Sunlight is rapidly fatal to tubercle bacteria, but it by no means has opportunity to freely act upon infectious material out of doors. Indoors, the tubercle bacteria may remain alive and dangerous for many weeks. The eating habits of fowls indicate that they are in danger of infection by way of the crop in the roosting-houses, although no food may be there. Furthermore, there always exists the possibility of conveying infectious material by the feet, to the food outside.

Tests.—There is at present no means of detecting the existence of tuberculosis in a fowl until the affection has progressed sufficiently to produce lameness or emaciation. There is reason to believe that fowls may be diseased badly enough to make them a source of danger to other fowls, without suggesting by their appearance that they are affected. The tuberculin test so generally used for the detection of the disease in cattle does not give positive results when applied to tuberculous fowls. Tuberculin is a liquid prepared from beef broth in which the tubercle bacteria have been cultivated for several weeks. When injected under the skin of cattle affected with tuberculosis, it produces a rise of temperature usually about two degrees above normal. The test, in competent and honest hands, affords a ready means for detecting the disease when other means would fail. Trials upon twenty-one fowls affected with the disease have not indicated that the test may be successfully applied to them.

Even should the tuberculin test prove applicable to fowls, its usefulness would be limited, on account of the impossibility of applying it to a large number of them, as would be necessary on a large poultry ranch. Nevertheless, the test would be very useful in experiments to determine the possibility of the transmission of tuberculosis of man or cattle to fowls.

The Control of Tuberculosis in Fowls.—There is no known remedy for the cure of tuberculosis in the fowl. Affected birds should be killed as soon as the existence of the disease is recognized. It is useless to attempt treatment. It must be controlled by measures designed to keep the healthy fowls separated from the diseased ones.

When the disease exists in a flock of fowls there are usually many in the early stages that do not betray their conditions by appearance or behavior. This insidious mode of development is an important characteristic of tuberculosis and one that frequently blinds people to its seriousness. There is no apparent way of recognizing all the tuberculous fowls in a flock so that they may be removed. Therefore, all the individuals in an infected flock must be regarded as dangerous to those free from the disease, and must be kept separated from them. To counterbalance this difficulty the problem of controlling tuberculosis in fowls has some encouraging features. The useful life of the hen is generally regarded as ended at three years of age. This fact obviates the necessity for the quarantine of infected individuals for many years, as is done with cattle. The further spread of the disease through a flock where it already exists may be impeded by sanitary measures. Fowls suspected of having tuberculosis should be slaughtered promptly. The roosting-houses should be cleaned and disinfected as often as practicable. It should be remembered that cases which can not be detected are constantly spreading the germs of the disease about the houses, and in consequence the effect of one spraying with a disinfectant is of short duration. There are upon the market several disinfectants that are suitable for the purpose.

There is good reason to believe that young stock may be kept free from tuberculosis by completely isolating them from hens among which the disease exists, or from land recently occupied by such fowls. The conditions under which the poultry business is carried on do not seem to offer serious objection to such practice. In the establishments where the fowls are kept in inclosures this condition may be easily maintained. Upon the larger ranches where the fowls are not restrained, and roam at will in the vicinity of their respective colonies, the quarantine may not be so strictly enforced. Much danger may be avoided by locating the colonies of pullets as far as possible from the old stock, or from land recently contaminated by them. The complete isolation of the young from contact with the diseased is a precaution unquestionably successful in preventing the spread of tuberculosis in man and cattle; and there seems to be no reason why the principle should fail in the case of poultry. The experiment is being tried with pullets hatched during the present season.

Transfer of laying hens appears to be an important cause of the spread of the disease to ranches where it has not hitherto existed. On sanitary grounds the purchase of grown stock is condemned as dangerous; for there is a strong probability that the purchaser will receive fowls from a flock that has had a bad record of deaths from tuberculosis or other causes. Enough examples of such cases have been observed to warrant wording an emphatic warning. *Those embarking in the poultry business should aim to raise their own hens.*

Relation to Tuberculosis in Man and Cattle.—The subject of the relationship between tuberculosis in man or cattle and the disease in fowls is full of interest. Tuberculosis in cattle is prevalent in the same district in which the disease occurs in fowls, and examples of tuberculosis in both cattle and fowls on the same ranch have been observed. Attempts by Gilbert and Roger* to transmit the disease from man or cattle to fowls have usually failed. Successful transmission of the disease to fowls from man or cattle has rarely been accomplished.

Tuberculosis in man is not noticeably prevalent in the community where most cases of the disease in fowls have been found, for it is not frequented by consumptives in search of favorable climatic conditions. The possibility of the transmission of tuberculosis from poultry to man is a matter concerning which it is exceedingly difficult to collect evidence. The fact that chickens, when eaten, are always well cooked indicates that there is practically no danger from that source. It has not been proven that tuberculosis is transmitted through the egg, and furthermore, most eggs are well cooked when served. It does not appear, therefore, that tuberculosis in fowls is a matter that very intimately concerns public health.

Summary for the Control of Tuberculosis.—Kill all fowls showing symptoms of the disease. Separate the flock of affected fowls as thoroughly as possible from the healthy ones. Spray the roosting-houses with a disinfectant as frequently as is consistent with the expense and value of the fowls. Take care to keep the young pullets away from the diseased stock or from land recently occupied by the latter.—(Calif. B. 161.)

FOWL CHOLERA.

The disease now known as fowl cholera has been recognized in Europe as a serious menace to poultry raising since the latter part of the 18th century. It was not, however, until past the middle of the 19th century that the fact of its contagious character was fully established and strict quarantine regulations adopted to prevent its spread from one country to another. At the present time the disease is common throughout all Europe and produces annually very great losses to the poultry industry in nearly all branches. Although the disease does not appear, from current reports, to be present in England,† it was probably present in this country not long after 1875. Soon after this date several epidemics were reported which it cannot be doubted were fowl cholera. After its first appearance in the United States, it was many years before the disease had spread sufficiently to attract even the attention of students of poultry problems; and even now, although the indefinite term, "cholera," is frequently on the lips of poultrymen, very few of them really know the nature of the malady, but group under the name, cholera, a varied assortment of ailments which have various causes, and no relation whatever to the real fowl cholera.

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*Gilbert and Roger, in collaboration with Cadiot: Contribution a l'etude de la tuberculose avaire. Etudes de Pathologie et de Clinique.

†Although not generally reported in England, there can be little doubt of its presence there. The same applies to several other poultry diseases. No definite study of the diseases of poultry in Great Britain appears ever to have been made.

It is only within the last decade that the presence of fowl cholera in the New England States in general, and in Massachusetts, Rhode Island, and Connecticut, in particular, has been urgently brought before the investigators of poultry diseases as a gradually increasing source of danger to the poultry industry as a whole, and as a definite problem to be attacked by those few investigators who are concerned with problems of poultry hygiene.

In Rhode Island the evidence gained from poultrymen who have sought aid from the Agricultural Experiment Station, and the results of consequent investigations which the Station has made in connection with the reported epidemics, all testify to the fact that fowl cholera is increasing in that State. Many poultrymen in Rhode Island and in Massachusetts have lost the majority of their flocks, numbering from twenty to several thousand birds.

Character and Symptoms of the Disease.—Fowl cholera is an acute, highly contagious disease, affecting especially the intestines, lungs, liver and spleen of nearly all poultry (especially fowl and water fowl), manifesting itself by very high fever, accompanied by yellowish diarrheal discharges, and terminating fatally in the majority of cases as a result of internal hemorrhages, or interrupted respiration. The first appearance of the disease in a flock is likely to be sudden, and the first birds die without apparent cause; they may lie dead under the roosts in the morning or they may be found dead on the nest. At the beginning of an epidemic, while the disease is in its acute stage, it is unusual to observe the birds while they are sick, since they die so suddenly. After a few days, however, the disease usually becomes transformed into a less acute type, in which the birds are frequently seen to be ill. They may walk slowly about the yards, or crouch with ruffled feathers in remote corners, eating little and avoiding their companions. From time to time they stretch their heads and necks forward, or from side to side, as if cramped or in pain. There is an obstinate diarrhea, the feathers become stained and the thirst is increased; the temperature rises to 110-112° F. Finally extreme weakness comes on, the head falls forward until the beak rests on the floor, mucus oozes from the mouth, and the eyes are closed. Thus the bird may remain for some hours, breathing with difficulty, until at last the body rolls to one side, there are a few convulsive twitches of the limbs, one long extension of the leg muscles, a cough or two, and the bird expires. The acute form endures from 1 to 3 days; the chronic form, several weeks. The duration depends largely upon the virulence of the infecting organism.

*The Causative Organism.**—The micro-organism causing fowl cholera was recognized in 1878, although it does not appear to have been cultivated in pure cultures until 1880, by Pasteur and Toussin. It is one of the smallest of the disease-producing bacteria, and has received the name *Bacillus bipolaris septicus* (syn. *B. cholerae gallinarum, S. avicida, Pasturella avium*). The organism is pathogenic to practically all poultry, also to mice. For rabbits and guinea pigs, though not often fatal when inoculated subcutaneously, it produces abscesses.* It is not highly resistant, being rendered non-virulent by light, and it is killed by a temperature of 80-85° C in ten minutes. It resists freezing, however, for fourteen days, although prolonged cold weakens the virulence. It appears to be killed by weak germicides, such as 1 per cent carbolic acid. It is not motile.

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*A study of the biological relations and cultural peculiarities of the fowl cholera organism is now being conducted at the Rhode Island Station, and will be published at a later date.

In the diseased bird, the organism can be found in the blood and in nearly all the organs. From these it can be removed by bacteriological methods and examined miscroscopically and in cultures. Such an examination is of value in the diagnosis of the disease.

The Origin of the Disease and Its Manner of Transmission.—Just how the disease gains its entrance to a flock is not known. It is known, however, that the causative organism is found occasionally in the intestinal canal of apparently healthy poultry. It is also present at times in the intestines of certain wild birds, especially pigeons. Therefore, while it cannot be doubted that many epidemics owe their origin to the importation of germs from neighboring farms, to infected birds obtained in, or returning from, poultry shows, or to infected pigeons or other wild birds which have casually visited the location of cholera epidemics, it is true that some epidemics do appear to arise spontaneously; and this circumstance can be explained only on the grounds that the germs of cholera, which live for some time harmlessly in the intestinal tract of poultry, may, upon occasion, suddenly acquire a greater virulence, which for a time increases as the organisms are passed on through successive birds. The virulence may again subside during the last of the epidemic, and the organism return to the inocuous condition of a harmless parasite in the intestinal tract of the fowls. Such possible rises and falls in the virulence of an organism during the course of an epidemic are not yet well understood by investigators. It is possible that certain species of wild birds, such as pigeons (which are very susceptible to cholera) may serve to heighten the virulence of organisms which at first have only a feeble pathogenic power for other poultry.

Thus, although little is ever ascertained regarding the origin of a given epidemic, more data are available to show in what way, when the disease has once entered a flock, it spreads from one bird to another. It is well known that the excreta from the intestines of sick birds are loaded with the causative organisms, which are disseminated about the poultry houses and yards. Experiments have shown that the disease may be produced in fowls when this material has access to the blood of birds through open wounds in the comb, wattles or feet. Even the membranes of the mouth may be penetrated; but above all, infection comes about through the ingestion, along with food or water, of material containing the disease-producing bacteria, picked up from the yard or roosts. By this last means, if the organisms are particularly virulent, the disease may pass through an entire flock, eventually killing all. If the range is a large one, there is always danger from the fowls picking at the bodies of their dead companions when these are left to decay on the premises.

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*Rabbits may die when infected with very virulent cultures.

The Treatment of Fowl Cholera.—The treatment of fowl cholera may be carried on by protective inoculation or by medication. It is an interesting fact that the fundamental work of Pasteur upon protective inoculation in fowl cholera about 1880-82, was the first attempt to produce by use of artificial "cultures" immunity against a communicable disease, and was the basis of all later work in this field, the valuable results of which, at the present day, we see in the protective inoculation for diphtheria, lock-jaw (tetanus), cerebrospinal meningitis, and several other diseases.

Pasteur ascertained that by inoculating fresh cultures of the virus of fowl cholera he could, in almost every case, produce the disease in fowls so inoculated. He learned also that, if the cultures for inoculation were not used when fresh but after exposure to the air, they might not produce the disease, for they seemed to have lost a part of their virulence. Moreover, the extent to which they lost their virulence appeared to correspond directly with the time during which they had been exposed to the air. Thus Pasteur obtained two grades of attenuated or weakened cultures, one of which was very weak, the other, somewhat more powerful; yet neither so virulent as the fresh cultures. But the important part of this discovery was, that after a fowl had first been inoculated with the weakened cultures, it could be subsequently inoculated with the virulent culture without harm resulting; whereas, if the fresh culture had been given first, it would surely have killed the bird. Hence the inoculation of the weakened cultures had caused the formation, in the body of the fowl, of certain substances (anti-bodies) that were able to protect the bird against the stronger virus which was introduced later. These anti-bodies, or immune bodies, appeared to neutralize the poison produced in the body, by the organism of the unattenuated culture, and thus to prevent the bird from having the disease in a severe form. This was dependent upon the fact that the blood of the inoculated bird had undergone some change that gave it a protective value.

Naturally, this method of Pasteur's for treating or preventing cholera (producing active immunity), was not a very practical one for the use of the poultryman: First, because it was a difficult matter, requiring a laboratory, to prepare the inoculation material; and second, because each bird required several inoculations before it was sufficiently protected to withstand the unattenuated culture. For this reason, although the method has been of immense value to mankind, in that it has shown the way to other methods of producing protective inoculation against communicable diseases, it has proved of slight practical value to the poultryman, who, for the treatment of his birds, requires a more simple and direct method.

HOW TO RECOGNIZE THE PRESENCE OF FOWL CHOLERA.

The poultryman must not be deceived into believing that the first disease which causes a high mortality in his flock is necessarily fowl cholera. Unfortunately many poultrymen have a tendency to use the term in a very loose sense, and place under this head almost any ailment that is accompanied by diarrhea, and causes the bird to sit in a corner with ruffled feathers. The real cholera of fowls usually manifests certain specific, clinical features and pathological appearances, which the observing poultryman will have little difficulty in recognizing. In order of their importance these clinical features are as follows:

Sudden Death.—The early deaths are likely to be of this character. Sick birds are seldom seen, but they are found under the roosts dead, in the morning. Later in the course of the epidemic the duration of illness is greater.

Yellow or Green Excreta.—This is a very characteristic symptom. The excreta of normal fowls is not yellow; and when it is green, it is dark green, approaching black. In cholera both the yellow and the green are bright; the green is often an emerald green. These different colors may occur either alone or separately; and both are usually accompanied by diarrhea and the extrusion of thick mucus. In case it is known that cholera is in the neighborhood, it is well for a poultryman to examine, from day to day, the character of the droppings on the dropping board.

High Temperature.—The temperature of the normal fowl is between 106° F. and 107° F., higher at evening and lower in the morning, although fowls show many individual irregularities, some having a higher, some a lower, temperature. Within a few days after infection the temperature rises to a point between 109° F. and 112° F., sometimes slightly higher. From this point it falls gradually until death or recovery takes place. The poultryman can easily take the temperature of sick birds by means of a veterinary clinical thermometer.

What to Do at the Beginning of an Epidemic.—After a poultryman has decided that the disease which has entered his flock is actually fowl cholera, it is advisable to undertake, without delay of an hour, immediate steps to check the progress of the epidemic; and these measures depend first upon the manner in which the poultry are kept,—whether in a single house, in colony houses with unrestricted range or in miscellaneous sheds, lofts, boxes, etc. Again there is a difference in procedure depending upon whether the poultry are yarded in groups or run together. It may be said at the beginning that, when the disease appears among fowls which are allowed to run together in large numbers, the outlook for checking the epidemic is not favorable. Assuming a case in which there are several hundred birds in a long house containing a number of pens with their associated yards, suppose that a poultryman has observed several deaths in two of the pens, and has diagnosed the disease as fowl cholera. His immediate procedure should be as follows:

1. Place the dead birds temporarily in an enclosure out of reach of all other fowls.

2. Fill a spray pump (which no poultryman should be without) with a 3 per cent solution of Zenoleum, Hyco disinfectant, Chloro-naphtholeum, or other reliable disinfectant, and make an inspection tour of all pens, examining closely the dropping boards for the characteristic yellow and green excreta. If found, spray thoroughly the entire surface of the dropping board, then go outside to inspect the yard and the birds. First examine the premises for the presence of characteristic excreta. If found, cover with soil and spray the top to prevent the birds from picking it over. Next examine the birds for sick ones, or those showing stained feathers behind. If any are found place them inside the house, shutting all entrances, and go to the next pen.

3. As soon as all the pens have been inspected in this way, remove and kill all the birds which were confined in the house, still keeping the other birds outside.

4. Next, go through the house and collect all fountains, drinking-pans and feed-pans, if present. Secure a large tub, fill this with 3 per cent Zenoleum (one part Zenoleum to 32 parts water) or other reliable disinfectant, and immerse the dishes, fountains, etc. Remove them after an hour and return them to the yards of the pens where infection is present and to the pens of the others. Fill them with water in which has been dissolved sulphate of iron at the rate of one ounce of the sulphate to three quarters of water.

5. Bury very deep (at least three feet), or burn (after soaking the carcasses with oil), the bodies of the dead birds.

This is all that can be done at the start, since it is better to delay further disinfection of the infected pens until the further course of the epidemic is disclosed. From this time on, however, the poultryman should keep all the birds under careful and frequent observation, inspecting all the yards, and also the houses that are still open, for other sick birds and for signs of the characteristic excrement. As soon as the latter is found it should be gathered at once into a pail. The place should then be sprayed, and the material destroyed. Sick birds, as previously indicated, should be removed and killed. Close observation and immediate action in the particulars mentioned above will make chances about even for checking the epidemic at the start, but these precautions are of little avail after even a quarter of the flock have died, and the remaining birds have been infected. If these measures check the epidemic at the outset, then all pens may be disinfected, and the fowls allowed to return to them.

SUMMARY.

1. Fowl cholera has been known in Europe for more than a century. It was not recognized in the United States until about 1875, but now is common in many parts of the country. Its prevalence in New England, and in Rhode Island in particular, appears to be increasing.

2. Fowl cholera is an acute, highly infectious disease, affecting nearly all poultry; it is characterized by high fever and general septicemia, and produces high mortalities in adult birds. Young birds are less susceptible.

3. The symptoms are: (1) sudden death, (2) a yellowish or greenish diarrhea, (3) general weakness. Recovery is infrequent.

4. The pathological conditions include: (1) hæmorrhagic inflammation of the intestines and lungs, (2) enlargement and softening of the liver and spleen, with minute hæmorrhages on the surface of the former and on the heart.

5. The cause of fowl cholera is a minute micro-organism (*Bacillus bipolaris septicus*) which grows in the blood and in the organs. The organisms are present in great numbers in the excrement and in the blood of diseased birds, and it is through the ingestion of infected material that the disease is usually transmitted.

6. Fowl cholera has been treated in Europe by means of serum inoculations, some of which are commercial preparations. But these have not been placed on the market in this country, and even abroad they have not given uniformly satisfactory results.—**(R. I. B. 144.)**

GOOSE SEPTICAEMIA.

Cause of the Disease.—This disease is caused by bacteria having the characters of the fowl cholera (or more generally rabbit septicæmia) type. *Goose septicæmia* is produced by a variety of the above. It belongs to the same group of easily-perishable non-resistent bacilli as those of swine plague.

Diagnosis.—The only diagnosis of goose septicæmia that can be made by the layman is by a careful study of any suspicious cases. and a comparison with the history of this disease or any other outbreak that may be recorded. So few diseases of this kind attack geese that it is possible that there can be no grounds for confusion with other diseases.

A loss of a majority of those attacked is sustained, and the disease dies out on account of lack of new material. The disease sometimes persists in flocks for some weeks, though comparatively few die at a time, even less than a third die, though nearly all the pens be affected. This condition is explainable on the ground that the germ is transmitted from one to another, and that only those into which the germ can gain entrance through a wound are affected. The bacteria cause death by the poisons produced, by their rapid multiplication, by their living upon the blood of the animal, by the excretion they give off into the blood. The quickest death noted, less than eighteen hours indicates how rapidly the germs must multiply to produce the myriads which are necessary to cause death.

Remedies.—The treatment of goose septicæmia must ever be preventive. Medicinal treatment is unavailing, on account of the small value of each patient, the difficulty of early diagnosis and treatment, and the character of the disease—which practically forbids any but symptomatic treatment even in the case of larger and more valuable animals.

Practical Conclusions and Suggestions.—An outbreak of goose cholera does not at present seem to be a serious impediment to goose raising, for the indications are, if it reoccurs, that it may be easily controlled. It is advised to place fewer geese in each pen, at least as few as is compatible with the income from the business. In case of an outbreak in any pen it would be far better for the man who feeds them to keep outside the pens, and to remove dead animals to a safe distance, and either burn or bury them. Live animals removed from pens where the disease broke out might possibly again develop disease, in which case another removal would be required. While at first sight it seems cheaper to remove them to another pen, it would undoubtedly be more economical in the end to subdivide those removed into smaller lots, thereby reducing the chance of the spread of the infection to a large number. Unless the geese have had free range in a large field, it would not be necessary to remove the pen to any great distance, a simple setting over of the fences, to get them on new ground, being probably sufficient. Of course due care should be taken that no drainage goes from any infected pen to any of the new ones.—(R. I. B. 86.)

TAPEWORM IN TURKEYS.

Tapeworm and worms of all kinds are very injurious to turkeys.

Symptoms.—The presence of the tapeworm may be recognized through the indolent, drowsy spirits of those infested with it; a careful examination of the voidings will also reveal its presence, as those infested will pass small portions of the worm.

Treatment.—Powdered male fern is an effective remedy, and may be administered in doses of from 30 grains to 1 dram of the powder; or of the liquid extract, 15 to 30 drops. This should be administered morning and evening before feeding, the minimum dose to the younger, increasing the dose as they grow older. Oil of turpentine is an excellent remedy against worms of all kinds which inhabit the digestive organs of poultry. A common remedy made use of by some for the removal of worms from fowls is one drop of kerosene oil night and morning. This should not be administered to the very young, but may be used with impunity after they are a few weeks old.

DIARRHEA IN TURKEYS.

Looseness of the bowels or diarrhea is quite too often mistaken for cholera; but such looseness may come from any of several causes, such as bad feeding, dampness, filth, or infestation with lice. The removal of the cause is the very best cure. Feeding boiled rice and a little charcoal will be found to be of very great benefit. The remedy most often used is a mixture of equal parts of ground ginger, cinnamon, cloves, and cayenne pepper. This is mixed into the mash food, about a stroked teaspoonful to a dozen very young poults. Double the amount after they are four or five weeks old. What is known as Sun cholera mixture is very beneficial, either when mixed in the drinking water or the mash food. This may be given so that each would have from 5 to 20 drops at a time, according to age.—(Agr. Dep. F. B. 200.)

Apoplexy.—This is a disease of the brain caused by the rupture of one of the blood vessels. The bird is attacked suddenly and falls down, apparently dead or nearly so. The usual cause is too high feeding, but it may also be due to some other provocation, such as sudden fright, violent exertion, or straining in laying eggs. Fowls are sometimes found dead on the nest or under the perches. There is usually no previous warning, and so in most cases treatment is impossible, as the bird usually dies almost immediately. When, however, the sufferer is still alive pierce a vein on the underside of the wing and let it bleed freely. This will reduce the pressure on the brain and often result in a cure. The bird should then be kept on a limited diet for some time in order to reduce the surplus fat. As preventive measures, regulate the diet and give plenty of exercise.

Vertigo.—This is also a disease of the brain and may be regarded as a minor kind of apoplexy. The bird shows giddiness, throwing its head upward, backward, or to one side. The gait is uncertain and staggering, the sufferer often running around in a circle. Sometimes the bird falls to the ground, fluttering and making convulsive movements with the legs. The bird can often be revived by holding its head under a stream of cold water. After this keep the bird in a cool and shady place for some time and regulate the diet.

Bronchitis.—Bronchitis is a cold accompanied by a rattle in the throat or by a cough, and may be caused by exposure to dampness or cold temperature or by drafts of air. In the majority of cases the removal of the cause and good care will result in a cure. Inhalation of steam or vapor from boiling water has been found beneficial. Giving a teaspoonful of equal parts of cider vinegar and water has proven successful in some cases.

Catarrh.—Catarrh is a form of cold that is quite common among fowls, and may be caused by dampness, drafts of air, or exposure to cold. It is indicated by a watery discharge at the nostrils, which later becomes more viscid. Remove the cause, keep the birds fairly warm, and give them plenty of easily digested feed. The injection of kerosene into the nostrils is also beneficial. This may be done with a small syringe, a medicine dropper, or a small oil can. If catarrh has become confirmed, the nostrils and throat should be cleansed with hydrogen peroxide and equal parts of water several times daily, and the nostrils greased with vaseline.

Diphtheria.—The marked symptom is the appearance of a diseased growth in the throat and inside of the mouth, resembling raised patches of whitish or pale-yellowish skin, which may invade the entire throat and mouth, often also appearing like ulcers or sores on the face, comb, and about the eyes. Make a swab of cotton tied on the end of a stick and swab out the mouth with hydrogen peroxide. Remove any of the growths that come away easily.

This disease is very contagious, and any birds suffering from it should be removed from the flock and the premises disinfected.

Roup, or Contagious Catarrh.—The first symptoms of this disease are similar to those of simple catarrh, but as the disease advances there is often swelling of the sides of the head and the nostrils become closed with thick mucus, causing the bird to breathe through the mouth. If the swellings contain pus, they should be opened with a sharp instrument, the contents removed, and the wound treated with a mild antiseptic, such as a 2 per cent solution of carbolic acid. The application of kerosene mixed with an equal part of olive oil has given good results in many cases. When a fowl has a bad case of roup, it is usually better to kill it, unless especially valuable.

Pip.—This is a condition of the tongue caused by some such ailment as a cold, which compels the bird to breathe through the mouth. The continual passing of air over the tongue causes it to become dry, hard, and scaly, especially about the tip. The best remedy is to remove the cause, also wet the tongue two or three times a day with a mixture of glycerin and water, equal parts.

Bumble Foot.—This is caused by bruises on the bottom of the foot, and is often due to the fowls having to fly from rather high perches and alighting on hard and uneven surfaces. Remove the cause by lowering the perches. If the foot is swollen and the swelling is filled with pus, it should be lanced and the pus permitted to escape. The wound should then be washed out with a 2 per cent carbolic acid solution, greased with vaseline, and wrapped with a piece of cloth.

Crop Bound.—The crop sometimes becomes overloaded with feed, and its thin muscular walls become distended and partially paralyzed, so that the organ can not be emptied, or the opening into the lower esophagus may become clogged with a feather, a straw, or some other substance which the bird has swallowed. The crop is greatly distended and the mass of feed is rather hard and firm. In both cases the symptoms are the same and treatment should be conducted on the same principles. For treatment pour one-fourth to one-half ounce of melted lard or sweet oil down the throat and manipulate the contents of the crop with the hand in such a way as to tend to break up the mass. Unless the passage is closed the contents of the crop will usually pass away within a few hours. For a few days feed should be limited in quantity. If the foregoing method is ineffectual and an operation becomes necessary, clip away the feathers from a portion of the crop and with a very sharp knife, lancet, or razor make an incision about 1½ inches long through the skin and the wall of the crop. Then carefully remove the contents of the crop with the finger, the handle of a spoon, or some other convenient object, and wash out the crop with warm water. Pass the finger, well oiled, into the esophagus to see there is no obstruction. Sew up the wall of the crop first and then the outer skin, using white silk or linen thread, being careful not to sew the two membranes together, and in a few days the wound will be healed. Feed sparingly on whole grains until the wound heals, and do not give any water for twenty-four hours.

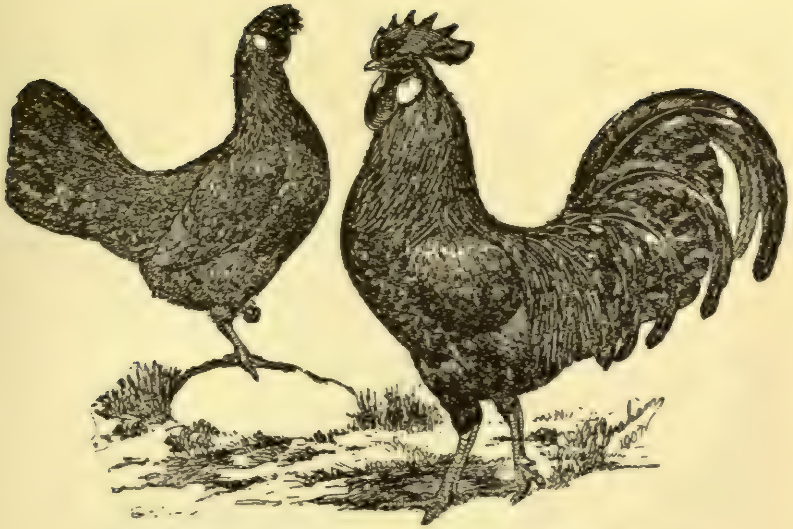
Diarrhea.—This is caused by some irritation of the digestive system, and may be due to the quantity of the feed, the quality of the feed or drinking water, or to climatic conditions to which the fowl has been exposed. There is a general depression, roughness of plumage, and a loss of appetite, and usually frequent expulsion of soft, whitish, yellowish, or greenish excrement, the droppings becoming more liquid until severe diarrhea is present. When the affection is at all serious, the excrement may become mixed with mucus or blood. It is important that the cause be sought out and removed. See that the birds have comfortable quarters and that they are not exposed to drafts, cold or dampness. If taken early, diarrhea can often be checked by reducing the amount of green and animal feed and feeding largely on dry feed, eliminating the moist mash. Give a tablespoonful of sweet (olive) oil as a laxative to carry off any irritating matters that may be in the intestine. In severe cases give 5 to 10 drops of laudanum to each bird.

Freezing (frostbite).—If the comb or wattles of fowls become frozen, and it is discovered before they thaw out, apply snow or cold water to remove the frost, for this gradual thawing will often save them. Then apply vaseline to the affected parts twice a day.

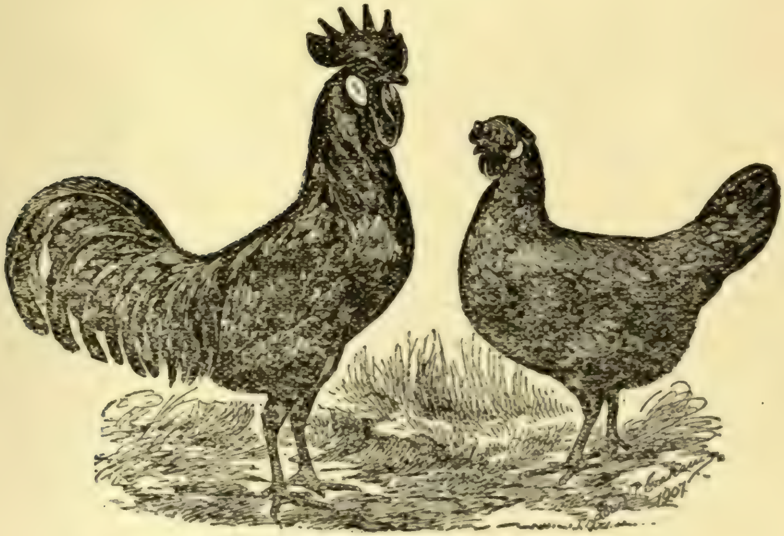
Scaly Legs.—This is caused by a mite which burrows under the scales of the feet and shanks, and is considered to be infectious, but does not spread rapidly. It is noticed most frequently in old fowls. The scales can be removed by soaking the feet and shanks in warm, soapy water and by rubbing or brushing them off with a toothbrush or nailbrush. After the scales have been removed apply sulphur ointment or equal parts of melted lard and kerosene. The frequent application of kerosene has also been found effectual without the previous soaking in water.

Chicken Pox, or Sore Head.—This is a contagious disease caused by a fungus, and occurs in chickens, turkeys, pigeons, and sometimes in geese. It is quite prevalent and very destructive among young chicks in the Southern States. The disease appears as an eruption of yellow nodules about the beak, nostrils, eyes, and other parts of the head. These nodules reach their full development in five or ten days, when they emit a watery discharge, which later changes to a thick yellowish matter. As the disease progresses the birds grow thin and weak, and death results. In cases of spontaneous recovery, the nodules dry up and form crust, which later crumble away. The parasite causing it penetrates the skin of a healthy individual either through an abrasion, through punctures caused by bites of lice, etc., or less frequently through the normal skin. The disease is most prevalent during warm, damp weather, and consequently is most fatal to late-hatched chicks.

The following preventive measures should be employed: Keep affected birds from the premises; keep the houses clean and dry, and hatch the chicks early. Sick birds may be treated by applying carbolic ointment, or glycerin containing 2 per cent carbolic acid,



Pair of Single-Comb Brown Leghorns. Dept. of Agr.



Pair of Single-Comb Black Minorcas. Dept. of Agr.

to the affected parts twice a day. The sores may also be bathed with soap and water to loosen the crusts and subsequently sponged with a solution of copper sulphate (one-half ounce to 1 quart of water). When other treatments are unavailing, tincture of iodine may be sparingly used.

Egg-bound.—Irritation of the oviduct, causing the membrane to become dry and deficient in its normal lubrication, an abnormally large egg, or a too fat condition of the hen may cause difficulty in expelling an egg from the body and produce the condition known as egg-bound. If the egg remains in the oviduct for a considerable length of time inflammation is produced, which finally develops into decomposition of the tissues and results in death. Fowls when egg-bound are restless, going frequently on the nest, showing a desire to lay and, in general giving evidence of being in distress. Later they become dull and listless, remaining in this condition until death if not relieved. The egg can usually be felt in the posterior portion of the abdomen. If the trouble is early discovered, inject a small quantity of oil into the vent, and gently try to work the egg out. If this treatment is unsuccessful, hold the lower part of the body in warm water for half an hour, or until the parts are relaxed; then treat as above. It may be necessary to break the egg, allow the contents to escape, and remove the shell in pieces. After removal of the egg give soft cooling feed.

Occasionally difficulty in laying an egg causes prolapsus or eversion of the oviduct. When this occurs the oviduct is partially turned inside out and protrudes from the vent. If the egg causing the trouble has not been expelled, remove it, wash the exposed portion of the oviduct with warm water, apply carbolated vaseline or lard, and return to its normal position by gentle pressure. In addition it is well to give the fowl 3 to 5 drops of fluid extract of ergot.

Intestinal Worms.—Worms are frequently present in the intestines and ceca of chickens, particularly young chicks, often causing considerable loss. Practically the only way to determine that worms are present is to examine the ceca and intestines of dead chicks. The worms are small and hairlike. Occasionally flat tape worms are found, but these are not very common. Chicks infested with worms go off feed and become thin and sickly looking.

In combating worms care should be taken to keep clean the soil over which the chicks run, and to move the runs each year or two if possible. Cleanliness in the house must also be observed. In treating affected birds, powdered areca nut (20 to 40 grains per fowl), administered either in mash or mixed with butter and made into pills, is an effective remedy. Powdered male fern (30 grains to 1 dram), or oil of turpentine (1 to 3 teaspoonfuls), alone or diluted with an equal bulk of olive oil, is also very good. It is well to follow any of these remedies with a dose of castor oil (1 to 3 teaspoonfuls).

Limber Neck.—This disease, as its name indicates, is characterized by the limp condition of the neck, the fowl practically losing all control of the neck muscles, so that the head rests on the ground. This condition occurs in warm weather, and is caused by the fowls eating decomposed flesh in which a ptomaine has developed. This poison causes partial paralysis of the neck muscles and often results in the death of the birds. Maggots eaten by fowls do not cause the disease, except as they may contain the poison which they have obtained from the decaying flesh. The best and most effective treatment is, of course, never to leave any dead fowls or other dead animals around, but to bury or burn all carcasses. Treatment of sick birds is not usually very successful, but a teaspoonful of castor oil is sometimes effective.

BAD HABITS.

Egg Eating.—This habit sometimes becomes a serious vice, fowls becoming very fond of eggs when they have learned to eat them, and it often spreads from fowl to fowl. It usually begins through accident by eggs being broken or frozen. Be careful to see that this does not happen. See that the nests are properly supplied with straw or other nesting material and have them darkened, so that if an egg is accidentally broken the fowls will not be likely to discover it. Supply plenty of lime in the form of oyster shells, bone, or similar substances to insure a firm shell. As soon as it is discovered that a fowl has formed the habit the fowl should be removed, in order to prevent the spread of the vice. Once formed, it is difficult to eradicate, and the safest remedy is the death penalty.

Feather Eating.—Fowls sometimes pluck feathers from themselves and from each other, which is often caused by too close confinement, by the presence of insect pests, or by improper feeding. When some of the fowls of a flock have formed the habit slightly, a wide range with a change of diet, including a plentiful supply of animal feed, and freedom from insect pests, will usually correct the evil. Above all see that the fowls have plenty of inducement to exercise. If the habit becomes well formed it is very troublesome and may necessitate the killing of some of the fowls in order to stop it.

INSECT PESTS.

Two classes of external parasites, popularly known as lice and mites, will be considered here. There are several varieties of lice which attack poultry. They subsist mainly on the feathers and perhaps on the epidermic scales. They are found largely on the head and neck, under the wings and about the vent, and when present in large numbers they cause the fowls much discomfort. Persian insect powder (pyrethrum), powdered sulphur, and some of the various preparations on the market, such as the louse powders, are good in combating these pests. The hens can be dusted with one of these powders after they have gone to roost. Have the powder in a box with a perforated cover, grasp the fowl by the legs, and shake the powder well among the feathers. Dust at least three times at intervals of about a week in order to catch the lice which hatch out after the first dusting.

The mites subsist on the blood of the fowls and are not usually found on the bodies of the bird except when at roost or on the nest. During the day they inhabit cracks and crevices of the walls, roosts, and nests. Sitting hens are often so annoyed that they are compelled to leave the nests in order to relieve themselves of these parasites. The free use of kerosene about the nests and perches is useful in fighting mites. The walls of the house may be sprayed with kerosene, the operation being repeated every three or four days for two weeks. Insect powders are of little avail.

The following method has proved excellent in ridding houses of mites and lice when the weather conditions are such as to permit the birds being kept outside the house for five or six hours. Close all the doors and windows and see that there are no cracks or any other openings to admit air. Get an iron vessel and set it on gravel or sand near the center of the house; place in the vessel a handful of shavings or straw saturated with kerosene, and on these sprinkle sulphur at the rate of about 1 pound to every 90 or 100 square feet of floor space. Instead of using the shavings and kerosene the sulphur can be saturated with wood alcohol. When everything else is in readiness light the material and hastily leave the house. In case any anxiety is felt about fire, a glance through a window will show whether everything is all right. There is very little danger of fire when proper precautions have been taken to have plenty of soil beneath the vessel. Allow the house to remain closed for three or four hours, at the end of which time one can safely conclude that there are no living beings inside. Now throw all the doors and windows wide open so as to drive out the sulphur fumes thoroughly, and then the fowls may be allowed to enter. Let them in one by one, and as each enters catch it and dust it well with insect powder, which will destroy the lice on the birds. Tobacco dust is also good to use instead of insect powder. The birds and house have now been freed from vermin for the present, but the eggs of the insects have not been destroyed, and in a week another swarm will be hatched out. Therefore it will be necessary to repeat the operation once or twice before the pests are exterminated. After this care should be used to see that no strange fowl is admitted to the house or yard without having been thoroughly rid of lice, for one lousy hen will contaminate all the rest.—(Agr. Dep. Farmer B. 287.)

FUNDAMENTAL PRINCIPLES FOR THE PREVENTION AND TREATMENT OF DISEASE IN POULTRY.

CLEANLINESS, THE FOUNDATION.

It is the object of this discussion to impress upon poultry keepers the one basal principle underlying all rules of health and upon which only can be erected a successful system of treatment of disease in poultry. In the final analysis one word furnishes the subject of this discussion and sums up its conclusions. That word is cleanliness. Cleanliness is at once the corner stone of health and the keystone of the arch of healing. If it can be shown that all deviations from health involve the integrity of this fundamental principle, cleanliness, it necessarily follows that any attempt at recovery must seek to restore cleanliness. As cleanliness is the first law in the science of preserving health, so is it the primary principle in the healing art.

This fundamental doctrine of cleanliness as applied to the well-being of poultry may be expressed in three general principles: (1) Clean intake; (2) clean output; (3) clean surroundings. The intake includes food, drink, and air. The output consists of excrementitious matter from the alimentary tract, the excretion from the kidneys, and the products of the reproductive system. The surroundings comprise houses, grounds, and air.

DEFINITION OF CLEANLINESS.

What does the word cleanliness mean? If one studies the dictionary, he will find that cleanliness means freedom from dirt or foreign matter. One's conception of cleanliness must therefore depend upon the notion of dirt, and that notion is largely a matter of training, habits, and associations.

The philosopher has defined dirt as "matter out of place." Matter that is all right and clean in one place may be all wrong and dirt in another. Moreover, cleanliness is one thing to the ordinary person, but altogether another matter to the hygienist. The eye with the microscope has a larger apprehension of dirt than the unaided eye. The good housekeeper sees with annoyance the specks of dust and is satisfied with their removal; the intelligent surgeon whose vision has been enlarged by the microscope sees the millions of bacteria that use a single speck of dust as an airship, and he knows of the possibility that tetanus bacilli or other germs may fall, unseen, from such dust on to the raw surface of an exposed cut upon a person's skin. He therefore can not call the cut surface of the wound "clean" until he has thoroughly washed it and applied disinfectant in order to kill those germs. The apples on the street vender's stand glow with apparent cleanliness, but those same apples may have been polished with a soiled pocket handkerchief, and the bacteriologist might well tremble at the thought of the tubercle bacilli that may be on those skins. The cook washes the lettuce leaves to remove the bits of adherent dirt, and the salad made therefrom may look and taste all right; but the unaided eye can not see the typhoid germs or other intestinal microbes derived from the sewage with which that portion of the garden stuff was fertilized.

The conception of dirt and cleanliness under discussion is formed by the sanitarian's training, habits, and associations. Farmers and poulterers are a class who read, and therefore have become somewhat familiar with the horizon of the scientist, so as to appreciate, in air and soil, in food and drink, in houses and incubators, upon the external and internal coverings of the chicken's body, the presence of innumerable microbes, many of them capable of producing decomposition and putrefaction, and thus likely to cause sickness through absorption of their poisonous products;

many of them characterized as specific agents of disease, and therefore recognized as a definite menace to life; and large numbers of them viewed generally as harmless which yet by excessive multiplication induce conditions which become themselves sources of disease.

The presence of these microbes in localities where they do not belong, or in excessive numbers even where they do belong, medically speaking, constitute dirt and calls for cleansing. To sum up, cleanliness involves not alone absence of dirt and foreign matter which can be detected by the unaided eye and removed by means of shovel and wheelbarrow, broom and dustpan; it involves also more or less freedom from those myriad microscopic forms the removal of which is accomplished by disinfecting agents which destroy them.

SEVEN PRIMARY PRINCIPLES.

In the working out of this fundamental law of cleanliness seven rules or maxims have been enunciated as furnishing, in a general way, the application of this principle to meet all the requirements of a successful poultry industry. These rules are but further divisions of the three general principles previously mentioned, and may therefore be regarded as the seven primary principles in the prevention and treatment of disease in poultry. They are as follows, and are expressed in mandatory form, since nature, in her sovereignty over animal life, demands it under penalty of disease and death: (1) Clean out; (2) clean up; (3) clean the water supply; (4) clean the food; (5) clean the eggs; (6) clean the incubators and brooders; (7) clean the breeding.

The ease with which these maxims can be carried out, and the cheapness of the articles employed for that purpose, combine to give them the maximum of practical value. It is true there are many different medicines with which to "clean out" the intestinal tract; there are a legion of disinfectants with which to "clean up" the soil, and numerous drugs with which to clean the water supply. If, however, the poultryman can become expert in the use of just one good and sufficient substance for the accomplishment of each of these primary principles, he is far better off than if his mind was stored with a whole materia medica which he has rarely or never tried. Notice how simply these maxims can be carried out:

Clean out by giving Epsom salt. Clean up by spreading powdered air-slaked lime. Clean the water supply by addition of permanganate of potash. Clean the food by preventing contamination or by applying heat. Clean the eggs by dipping in grain alcohol. Clean the incubators and brooders by scrubbing with hot water and good, old-fashioned kitchen soap. Clean the breeding by using the youngest females consistent with the requirements of good breeding.

METHOD OF APPLICATION.

Clean Out.—This is carried out as a routine hygienic measure by administering Epsom salt to the whole flock once a month from October to March, and twice a month from April to September. For this purpose the salt is best given in an evening mash, which, after the salt has been thoroughly mixed with it, should be sufficiently moistened with water to dissolve the salt. Let the mash be carefully proportioned to the appetites of the birds and fed on a dry, hard, clean floor, so that the whole may be eaten quickly. Epsom salt should not be wasted by putting it in the drinking water; the birds can not in that way take enough to secure the desired results.

The dose of Epsom salt may be estimated at one-third of a teaspoonful to an adult bird. Extra large fowls might receive a half teaspoonful, smaller or young birds less. One teaspoonful for three fowls, or for six to eight half-grown chickens, or for twelve to twenty chicks, according to age, size, and previous thriftiness is usually prescribed.

Immediately upon the appearance of disease in the flock, without waiting to determine whether the sickness is infectious or not, all birds, sick and well alike, should receive a dose of Epsom salt by the method above outlined. If the disease proves to be infectious, flock treatment with Epsom salt should be maintained once a week during the prevalence of the epizootic. All sick birds, which should be isolated at once from the well, may be given Epsom salt from one to three times weekly, according to the nature of the disease and the severity of the symptoms.

The best method of administering Epsom salt (as well as other fluid medicines), although practicable where only a few birds require treatment, is by means of a small funnel and a piece of rubber tubing (three-sixteenths inch internal diameter). The funnel is inserted into one end of the tubing, while the other end, lubricated with lard or vaseline, is passed into the mouth, back over the opening of the windpipe at the base of the tongue, and down through the gullet into the crop. One or two ounces of water in which has been dissolved one-third teaspoonful of Epsom salt can now be poured into the funnel and the tubing gently withdrawn. Since Epsom salt acts best when well diluted, this method may be considered ideal. If slender tubing is used and one is ordinarily careful in passing the tubing over the opening of the windpipe there is absolutely no danger attached to this method. Moreover, there is the satisfaction of knowing that the entire dose has been received by the bird.

Clean Up.—Do this by spreading powdered, air-slaked lime over runs (and range, if possible), floors of houses, and on the droppings boards. Emphasis must be laid on the two qualifications here given to the lime; it must be powdered and it must be air-slaked. Lime that is not powdered, even if the lumps be very small, must be regarded with suspicion as not being slaked and therefore more or less irritant. As soon as the birds begin to scratch where the lime has been spread, thus raising a dust, the irritating particles of the unslaked lime are inhaled, and, reaching the lungs, set up inflammation. In this way one might have an outbreak of pneumonia in his flock and be unable to explain its origin.

Clean the Water Supply.—There are three methods of accomplishing this, each being so easy of application that it may be substituted with entire satisfaction for either of the other two. The writer's usual prescription is to add to the drinking water permanganate of potash in sufficient amount to give the water a claret-red color. For ordinary waters, comparatively free from organic material, the amount of the permanganate of potash necessary should be as much as can be dipped up on a silver 10-cent piece for each gallon of water. If more than four times this amount of potash is required to color the water, it is well to assume that the water contains too much organic matter to admit of satisfactory disinfection by permanganate of potash.

In such a case the poulterer may employ the second method, that of adding sulphate of iron, commonly known as copperas. To 1 gallon of drinking water add 15 grains of copperas, which is approximately the amount that can be dipped up on a 5-cent piece. This proportion may be regarded as mildly antiseptic, but is as strong as should be used for any long period in view of its astringent action and drying effects on the lining of the digestive tract.

The third drug which has been found equally effective in the cleansing of drinking water is pure carbolic acid, in the proportion of one teaspoonful of carbolic acid to 1 gallon of water. The carbolic acid here recommended is of full strength. The poulterer who keeps on hand the acid in crystals may prepare the drinking water in the following manner: Place the unstoppered container in a pan of water; heat gradually until the crystals are melted. One teaspoonful of the melted crystals may then be added to a gallon of drinking water. If one desires to keep on hand a stock solution of the strong carbolic acids he can purchase any desired amount of liquefied phenol (phenol is the official name of carbolic acid) and add 1 teaspoonful of liquefied phenol to 1 gallon of drinking water. Or the liquefied phenol can be prepared by the poultryman himself by melting the crystals of carbolic acid as described above and to every 9 parts by weight of the carbolic acid adding 1 part by weight of water.

Clean Feed.—Purchase clean feed at the outset, and preserve in a clean, dry place protected from birds or other animals that might contaminate it with infective droppings. If through accident mold has crept in, and it is necessary because of insurmountable circumstances to feed this material, apply strong heat.

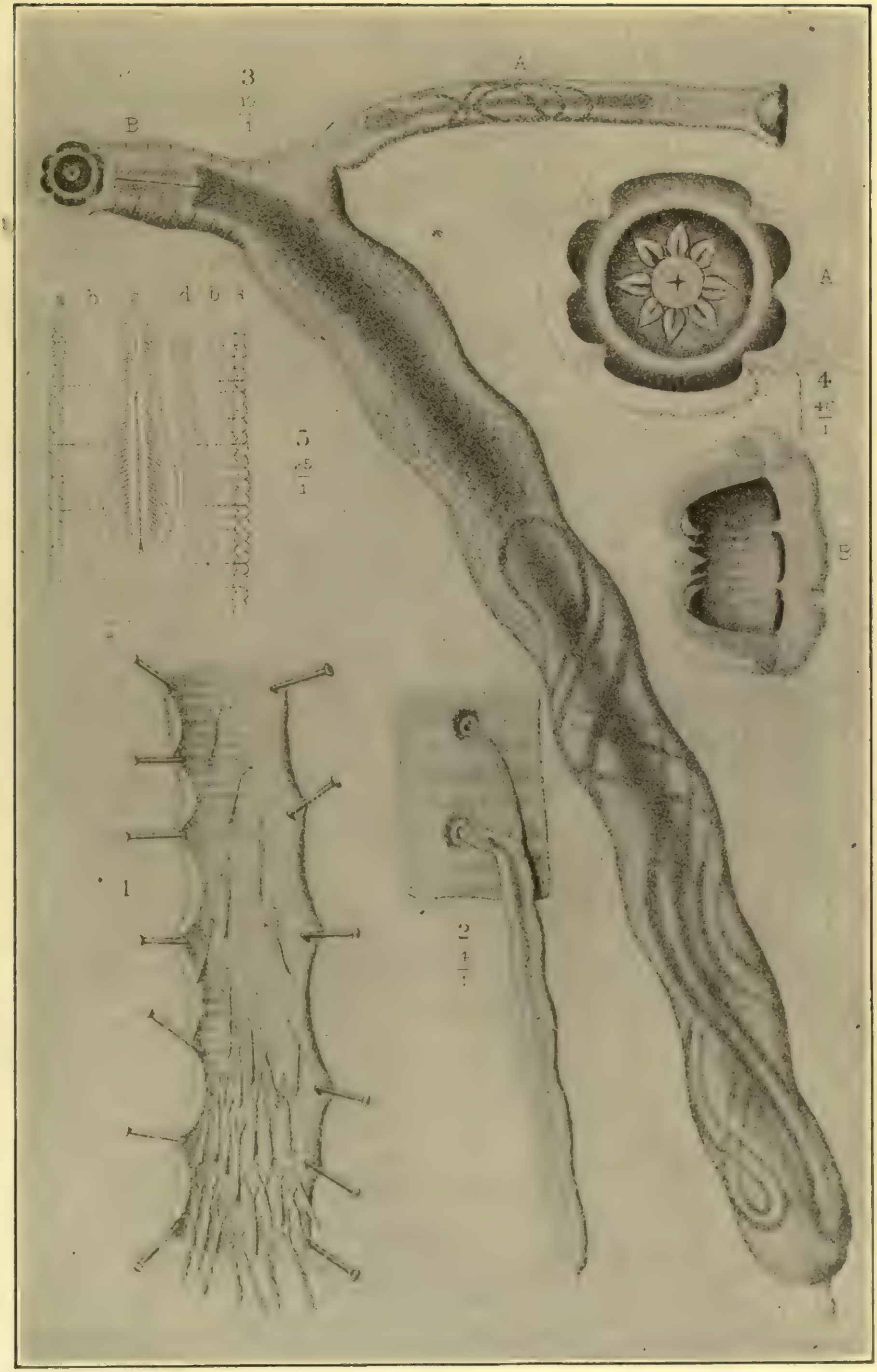
Clean Eggs.—Dip all eggs, just prior to incubation, in grain alcohol. That is, without doubt, the simplest and quickest method of disinfecting the shells of eggs intended for incubation. Various dilutions, from 70 per cent alcohol to the 95 per cent usually sold in the shops have been tried, and all are equally effective. Another method of egg-shell disinfection, simple but not as quick as the alcohol method, is to wipe all eggs just prior to placing them in the egg tray with a cloth saturated with a 3 per cent solution of compound solution of cresol (liquor cresolis compositus) or cresol soap. (A 3 per cent solution of cresol soap is made by adding 2 tablespoonfuls (1 ounce) of compound solution of cresol to 1 quart of previously boiled water.)

Clean Incubators and Brooders.—This is carried out by thorough scrubbing with boiling water and old-fashioned kitchen soap. If, however, this should not be considered sufficient, there may be applied, after the scrubbing, a spray with a 3 per cent solution of cresol soap, made as directed above, except that the water used in making the dilution need not be boiled, as suggested for egg disinfection.

Another excellent method of disinfection is by means of formaldehyde gas. The most widely accepted method of employing this disinfectant is that known as the permanganate-formaldehyde method. This consists of setting free the formaldehyde gas of the commercial product formalin (40 per cent formaldehyde in water) by the action of permanganate of potash. A modification of the method, known as the permanganate-diluted formalin, is particularly satisfactory because the addition of the water insures the moisture conditions needed for the best results from the formaldehyde, these conditions permitting also a marked reduction in the required amount of formaldehyde. As a preliminary to all directions for this method of disinfection it should be stated that the best authorities do not consider formaldehyde efficient at a temperature lower than 60° F. nor with a humidity less than 65 per cent.

Where one has an incubator room, the room should be disinfected with the incubators and brooders in it, together with all other movable appliances of the poultry farm, such as feed and drinking utensils, trap nests, and other appliances. All detachable parts of these appliances should be removed and placed about the room in such positions that the gas may have easy access to all surfaces. Incubators and brooders should be thrown wide open. Now, plug up all openings, doors, windows, and cracks with bits of cloth or rags. Cracks and other openings offering perfectly flat surfaces may be satisfactorily sealed with strips of adhesive plaster or wet strips of newspaper. For a room containing 1,000 cubic feet (say 10 feet square and 10 feet high, or 10 feet by 12 feet and 8 1-3 feet high) there must be used 11 ounces of permanganate of potash, 11 fluid ounces of formalin, and 9 fluid ounces of water. The procedure is as follows:

In the center of the room, upon the dirt floor or upon a base sufficiently large to protect the floor from stains by the red permanganate which may be spattered around, place a basin or flat earthen vessel with flaring sides that will not hinder the exit of the gas generated. In the bottom of this container place 11 ounces of permanganate of potash for every 1,000 cubic feet of space in the room. Have at hand 11 fluid ounces of formalin and 9 fluid ounces of water for every 1,000 cubic feet. Mix the formalin and water in a pail and pour the entire amount on the permanganate of potash. Leave the room immediately, closing the door tightly, and allow it to remain closed for from four to eight hours. After this the doors and



THE GAPE-WORM OF FOWLS. SYNGAMUS TRACHEALIS. DEPT. OF AGR.

windows should be opened (if possible from the outside in order to avoid entering the room and inhaling the pungent, irritating fumes of formaldehyde gas) and the room well aired for several hours.

It may sometimes become necessary to disinfect a single incubator or brooder. The following suggestions are offered for those who desire to use at such times the permanganate-diluted formalin method. Keeping in mind the impossibility of making these machines absolutely air tight, the following procedure and adaption of the ratio mentioned above in the disinfection of an ordinary 240-egg incubator is recommended. Start the lamp, so that the incubator shall be thoroughly warmed. Cover the slat bottom of the incubator with a few layers of newspaper, tacking or pasting (preferably the latter) the four sides. Plug all cracks and openings except the door space. Whenever possible, soiled diaphragms should be replaced with new felt or burlap, as the case may be. If it is not feasible to do this, wash off all dirt and tilt the diaphragms inside the incubator so that they may not interfere with the free progress of the gas. Put out the lamp. Place in the center of the newspaper-covered floor of the incubator a saucer containing 1 leveled teaspoonful of crystals of permanganate of potash. Mix 2 teaspoonfuls of formalin (38 to 40 per cent formaldehyde) with 2 teaspoonfuls of water and pour upon the permanganate of potash. Quickly close the incubator door, making the cracks as tight as possible by means of wet newspaper. After four or five hours open and air the incubator for a few hours. The pungent, irritating formaldehyde-laden atmosphere that sometimes lurks about the incubator after this treatment may be neutralized by placing in the incubator a saucer containing a very small quantity of weak ammonia water.

Clean Breeding.—This is accomplished by breeding from the youngest females consistent with good breeding.

REASONS FOR APPLYING THE MAXIMS.

The reasons connected with the application of each of the maxims are as follows:

Clean Out With Epsom Salt.—For the same reason that a chicken uses the dust bath, it is given the Epsom salt, namely, to get rid of or to diminish the number of parasites. The dust bath assists in removing the ectoparasites (outside parasites). The Epsom salt cleans out the endoparasites (inside parasites). Some of these may be large enough to be seen with the unaided eye, as, for instance, the various intestinal worms, whereas others may be minute enough to require high powers of the microscope for detection, or even be so infinitesimal as to belong to the class of ultramicroscopic germs.

It is customary to regard the presence of intestinal worms as a more or less normal condition and not deserving of any anxiety. But it may well be pointed out that the intestinal parasites of chickens, be they worms, molds, bacteria, or protozoa, are certainly not beneficial to the chicken. On the other hand, any one of them, no matter how apparently harmless, may produce disease or develop conditions in which certain well-known disease-producing parasites may operate, or may, during their so-called harmless development, evolve poisons which, given certain accidents to the lining membrane of the intestinal tract, may suddenly provoke a fatal disease in the bird. Hence it is necessary not only to clean out the intestinal tract by means of Epsom salt but to keep it in this condition.

What has just been said is not merely with reference to the prevention of disease. Suppose disease of any form has attacked the bird. It now requires the maximum of its disease-resisting powers for a successful defense. But suppose the bird is already engaged in battling with intestinal parasites and neutralizing their toxins. It is as if a nation engaged in civil war is suddenly called upon to defend itself against a foreign invasion. So, when the flock is attacked by disease or a single bird becomes ill, even though the affection be only bumblefoot, the poultryman should clean out with Epsom salt. By this means he will not only stimulate the disease-resisting forces of his birds, but will also relatively increase those powers by the removal from the intestinal tract of parasites and poisons which would otherwise have to be overcome.

Clean Up by Spreading Powdered Air-Slaked Lime.—This is important chiefly because of its association with No. 4 (clean food). More cases of disease are probably developed through parasite-contaminated food and drink than any other means. The causative organisms of disease in the respiratory and digestive tracts are passed out of the body of the bird in immense numbers in the droppings. Thus disease is spread from bird to bird by means of the infective droppings of a sick fowl or chick; or it may reach the flock from a neighbor's sick poultry by the wind wafting the dust from his poultry yard contaminated with the infection-laden droppings of his diseased stock, or being tracked from his place by dogs or cats or even by mutual friends, or it may be carried from place to place by such birds as sparrows and crows. It must be remembered, too, that it is not alone the sick birds that are thus a source of danger. In poultry hygiene as in human sanitation one must beware of the "carrier" of causative agents of disease, not only bacillus carrier but microbe carrier, using this latter term to include the molds and microscopic animal forms, such as coccidia, the cause of white diarrhea in chicks, and also parasite carrier, under which term are included the larger parasites, such as worms. These carriers are divided into three classes—sick carriers, chronic carriers, and healthy carriers. Against the sick carriers the poultryman is naturally forewarned and forearmed. But as the soldier dreads the ambushed foe, so let the poultryman be wary of the covert attack on his flock by parasitic enemies which stealthily approach the bird under cover of the once sick but now supposed to be cured bird (chronic carrier), and hidden in the intestinal tract of healthy birds (healthy carriers) that have simply picked up the parasites and are carrying them without being affected by them. Against all such risks the poultryman materially defends himself and his flock when he cleans up with powdered air-slaked lime.

Maxims 1, 2, and 3 form together a strong combination in combating the baneful influences of these carriers. The sprinkling of the lime should be carried out the same evening that the Epsom salt is given. The cleaning-out process is accomplished largely during the night and the air-slacked lime on the droppings boards serves to destroy the parasites thus ejected from their harboring hosts, whether sick, chronic, or healthy carriers. Therefore, whenever Epsom salt is administered it is well to sprinkle air-slaked lime about the premises, especially under the perches.

Clean the Water Supply.—Water-borne diseases are frequent in the poultry yard. If the poultryman permits, consciously or unwittingly, one sick bird to run at large with any of the contagious diseases of the head parts or with bowel diseases, it is practically certain that the water supply will be contaminated in less than one hour's time. In the case of a large flock affected with flagellate diarrhea, flagellates in less than one hour's time were found in the drinking water which has been sterilized and placed in thoroughly disinfected fountains. It is well known how boards of health throughout the country recognize the danger which lurks in the public drinking fountain, and endeavor to safeguard the public health by adopting the individual drinking cup. While the poulterer can not adopt the individual cup for his fowls, he can by hygienic methods secure an equally good result by adding every few days (daily during the prevalence of disease) one of the antiseptics previously mentioned. In the proportions named, these remedies do not actually disinfect the water, that is, destroy the microbes deposited in it by sick birds. They act rather as antiseptics, that is to say, they serve to inhibit the development of bacterial and other microbial life. This hindering of microbic growth occurs not only in the drinking fountain, but is maintained in the intestinal tract, thus making maxim 3 a splendid adjunct to maxim 2.

In ordinary circumstances, where drinking water is supplied in containers, these vessels should be sterilized once daily by means of hot water, and the water should be changed once a day in cool weather and twice daily in warm weather. During the prevalence of disease the water can not be changed too often and the vessels might well be scalded twice daily.

Clean Food.—This, as before stated, must be accomplished by preventing contamination, or, when that occurs, by the application of heat. A man once said, "Oh, chickens love moldy bread; they will eat all they can get of it, and it never hurts them." That man, unfortunately, had never learned to reason from cause to effect, and was, therefore, unfitted to deal with health questions. Few, if any, of the intelligent men and women who are practical poulterers would care to furnish moldy feed to their high-priced prize winners. Pathologists recognize a disease called mycotic enteritis, which is an inflammation of the intestinal tract, manifesting itself by diarrhea and caused by the presence of some mold. They also recognize mycotic pneumonia, which is an invasion of the bronchial tubes by the mold known as *Aspergillus fumigatus,* giving rise to the disease known as aspergillosis. This disease is of frequent occurrence in pigeons and pigeon feeders, due to the presence of this mold on the corn which the feeders take into their mouths along with water and force into the mouths of the "squealers" in a fashion similar to that practiced by the parent birds.

It is hard to estimate the immense value that hopper feeding has been to poultrymen in that it preserves the food from contamination such as occurs when grain is scattered. Nevertheless grain must be scattered, for the scratching shed is a necessity. However, moldy litter should be avoided. The removal of moldy clover chaff has been reported as ending a siege of aspergilloses in chicks (brooder pneumonia). Recently one of the State experiment stations purchased for litter some straw that had been baled while damp. A few days after the introduction of this straw the chickens began to die. Post-mortem examination revealed pneumonia, the lungs showing minute white spots. Bacteriologic investigation of these spots demonstrated the presence of a mold which was found also in the straw. The immediate removal of this litter and the introduction of clean straw checked the illness of the fowls.

These considerations point to the necessity of keeping the chicken feed free from mold; for example, moldy feed and meat scrap that "smells bad." With the latter, cases of bacillary diarrhea or toxic conditions similar to that known as ptomaine poisoning may be expected. If, in spite of the utmost care, as may sometimes happen, mold should creep into grain which it is compulsory to feed, treat it as the housewife has for years treated such accidents—by applying strong heat. There is immense satisfaction in realizing that the day is past when it was thought that moldy grain which could not be used by human beings would do for the horse, what was too bad for the horse would do for the cow, what was too bad for the cow would do for the hogs, and that which the farmer would not dare give to the hogs might be thrown to the chickens.

Clean Eggs.—The reason for dipping eggs, just prior to incubation, in grain alcohol is due to the fact that as they come from the hen they are compelled to pass through the cloaca, which gives passage likewise to the droppings. Thus the exterior of the eggshell is certain to be contaminated with whatever infectious microbes are lurking in the intestinal tract of the hen. If, as is very likely to be the case, the hen is parasitized with coccidia, the shells of her eggs are certain to be contaminated with the coccidial cysts, which under the influence of the heat and moisture of the incubator develop to the stage necessary for the transfer of the disease to the chick. Then, when the chicks begin to peck, as peck they will, during the first 24 hours, some of these cysts will be taken into the alimentary tract and, upon reaching the duodenum (that portion of the intestine immediately following the gizzard), will be dissolved by the pancreatic juice, so setting free the coccidial forms that attack the lining membrane of the intestine and thus precipitating an outbreak of white diarrhea in the flock. There are many poultry breeders who are prepared to vouch for the marvelous results that have followed the cleansing of eggs just prior to incubation. However, the eggshell is not the only source of the contagion of white diarrhea, so that merely dipping eggs and then continuing to be careless on all the other points is not likely to be a sufficient preventive.

Clean Incubators and Brooders.—The chief necessity for this is because previous use has tended to infect them. For instance, the infected eggs of a first hatch may not have been dipped, although through some fortunate combination of unrecognized factors the chicks did not come down with the disease; nevertheless, the organisms are there. Again, in view of the widespread infection of adult stock by coccidia and the writer's demonstration of the causative relation of these coccidia to the almost universally prevalent white diarrhea of chicks, every poulterer should act on the assumption that his adult stock is infected, that therefore the eggshells have been contaminated, and hence that a previously used incubator needs disinfection.

Clean Breeding.—Consideration of a few facts will demonstrate the advisability of breeding with the youngest females consistent with all known principles of good breeding. A few years ago the announcement was made that so-called brooder pneumonia is caused by the presence of a mold, *Aspergillus fumigatus,* in the lungs of the chicks. Cases dead within 24 hours after hatching in which more than half the lung tissue has been transformed into a solid, cheesy mass have been examined. Such a condition could not have developed after hatching. The time necessary for the development of such lesions would carry the starting point back to the period of incubation hence the only possible method of accounting for such early disease would be to suppose the presence of the mold within the egg and its development in the egg along with the embryo, the conditions of incubation being ideal for mold development. That eggs may carry mold infection has long been known. Gayon, in 1875, reported finding in eggs a mold which appears to have been *Aspergillus fumigatus.* Since that time several investigators have noted the presence in eggs of this pathogenic mold. More recent investigations have revealed also the presence of various bacteria, both harmless and disease-producing, in the egg contents.

The question now arises as to how and where this infection of the egg occurs. It is known that infection of the egg may take place by passage of the microbes through the shell from the outside. Eggs kept in damp places are known to be thus infected with molds, while eggs whose shells have been allowed to remain in a filthy condition have revealed a bacterial infection of their contents in marked accord with the microbic contamination of the outside of the shells.

Some very recent experiments have shown that the eggs of virgin pullets reveal a much lower rate of bacterial infection than eggs from females that have been associated with the male bird. The act of copulation as carried out among fowls always results in the introduction of more or less dirt into the oviduct of the female, thus entailing gradual infection of the egg tube and ovary with microbes found in the soil contaminated with poultry droppings, to say nothing of the transfer from the cock bird's cloaca of pathogenic micro-organisms derived from his own intestinal tract. It has long been recognized in a general way that infertile eggs did not suffer putrefaction in the incubator, while fertile eggs that did not go on to the development of the embryo were quite prone to become rotten.

The investigations referred to furnish the exact status of this question. There are infertile eggs other than those from virgin pullets but it is not so much the infertile eggs as the eggs from virgin pullets that are free from infection. And here the poultrymen's judgment and experience placed him on ground which the bacteriologist has now justified. Knowing from other and extensive investigations that constant breeding from pullets resulted in deterioration of the stock, poultrymen have taken to using their pullets merely as layers, reserving them for breeding only after the pullet age was passed. Then, as stated above, believing that infertile eggs did not spoil as quickly as fertile eggs, they decided that it was best to keep these laying pullets apart from the male bird. These investigations have justified this course and have also demonstrated that immediately upon association with the male bird the females are in danger of infection of the egg tube and egg bag and consequently of the egg itself. Recognizing this possibility that constantly menaces the breeding birds as against the layers, if disease persists among the chicks in spite of cleaning out the intestines of the old birds, and spreading lime about the place and cleansing the water supply, and dipping the eggs prior to incubation, and disinfecting the incubators and brooders, the poultryman should look to the breeding stock. It must be remembered that from the moment a hen is mated there arises the possibility of infection of the reproductive organs which may be transmitted to the egg and so to the embryo, causing either death in the shell or of the newly hatched chick. All mated birds must therefore be regarded as potentially infected.

The experiments of Rettger and Stoneburn at Storrs Agricultural Experiment Station in the investigation of *Bacterium pullorum* are conclusive as to the transfer of disease-producing microbes from the ovary of the hen to the egg and thence to the embryo, thus causing death of the embryo in the shell or a fatal septicemia of the newly hatched chick.

APPLICATIONS OF THE MAXIMS TO THE TREATMENT OF DISEASE.

It must not be imagined that all necessary treatment of disease begins and ends with the employment of the seven maxims which have been enunciated. These fundamental principles have their place as the basis of all successful treatment. In many cases they might, very likely should, prove sufficient in themselves. Frequently, however, they must constitute only the foundation upon which a complete and efficient treatment may be built. Hence it seems wise at this point to present somewhat in detail the application of these maxims in the treatment of some of the diseases of poultry. Fortunately, most of the important diseases may be so grouped as to permit suggestions for the intelligent application of these maxims to any disease. Such, it should be understood, is the sole object of this discussion. It is not a manual of treatment; it is, rather, an outline of treatment of some representative groupings of poultry ailments for the purpose of incorporating the maxims studied above and of showing their relation to whatever specific treatment—local or general—may be adopted.

DISEASES OF THE REGION OF THE HEAD.

The one prominent disease group that occurs to the mind in connection with this title is that collection of ailments known under the general term of "roup." This name includes all affections usually so designated by poultrymen in different parts of the country, namely, snuffles, wet nose, cold in the head, contagious catarrh, sore eyes, cold in the eyes, roupy disease of the eyes, diphtheritic sore eyes, sore mouth, sore throat, roupy disease of the mouth, diphtheritic sore mouth, chicken diphtheria, diphtheritic roup, and canker. Being an infectious disease, roup is caused by microbes, not by drafts or dampness. These latter are predisposing factors which operate, as in a common cold, by furnishing conditions favorable for the multiplication of the roup germs. Hence, roup should be before the mind in treatment when there occurs in birds any deviation from the normal in the condition of the eyes or upper air and food passages, whether it be watering of the eyes, running at the nose, or slobbering, on the one hand, or, on the other hand, the presence in eye, nostrils, or mouth of yellowish, cheesy material, and (note this particularly) whether, with any or all of these symptoms, there is or is not an odor.

Without doubt the only safe treatment of roup is to kill the sick birds by a bloodless method, immediately burn their carcasses, and then, directing attention to the apparently healthy birds, clean out, clean up, and clean the water supply as previously directed in maxims 1, 2, and 3.

If, however, the poultryman for any reason desires to treat the sick birds, they should be isolated at once, kept at a safe distance from the flock, and visited only after the healthy birds have received their usual attentions. The poulterer immediately on leaving the hospital should change or disinfect his shoes, remove his hospital overalls, and thoroughly wash his hands and clean his nails. He must keep constantly before his mind the fact that he is maintaining a pesthouse on his premises, and everything must be done to prevent transfer of the contagion from sick to well.

For the birds which are apparently well it is sufficient to clean out once a week, clean up by a liberal use of air-slaked lime, and clean the water supply daily. In the treatment of the isolated sick birds the indications are to clean out, clean up, clean the water supply, and apply local treatment (Epsom salt may be administered twice and even three times a week until signs of improvement are manifested). Local treatment will vary according to the different phases assumed by the disease. Nevertheless, all portions of the upper air and food passages should receive some attention. This is required by the intimate relationship existing between mouth, throat, gullet, windpipe, cleft palate, nostrils, orbit, and groove (sinus) surrounding the orbit.

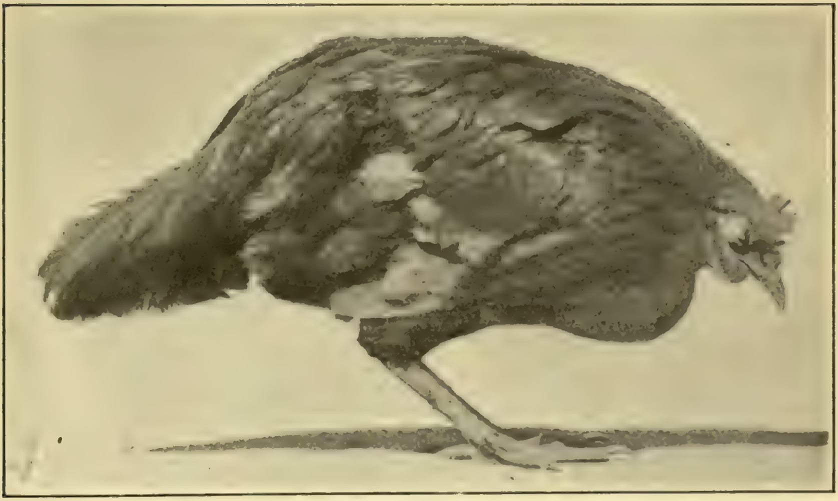
In all cases, by means of a medicine dropper or a small oil can, inject into the nostrils a few drops of peroxide of hydrogen. Flush the eyes with a saturated (4 per cent) solution of boric acid (1 heaping dessert-spoonful to 1 pint of water, preferably boiled water), or with a wash composed of 1 heaping dessert-spoonful of powdered borax to 1 pint of water. Remove all cheesy matter by means of a thin probe covered with absorbent cotton and wet with the solution of boric acid or borax. The mouth and throat should be swabbed freely with a mixture of equal parts of peroxide of hydrogen and boiled water. Cheesy matter in the cleft palate and canker patches in the mouth should be scraped away and the exposed surfaces painted with peroxide of hydrogen. Swellings under or around the eye are phases of roup and are best treated locally by injections into the nostrils and incision of the skin over the center of the lump, when, by a little pressure the contents usually roll out like the yolk of a hard-boiled egg. The cavity may be painted with tincture of iodine.

Chickenpox, or sorehead, is by some eminent investigators regarded as another manifestation of roup. Others equally prominent doubt the identity of the two affections. It is, however, a contagious disease, and, if treated, should be dealt with upon the same principles outlined above for roup. The indications are to clean out, clean up, clean the water supply, and apply local treatment. This last consists in removing the warts or scabs as they form on the comb or unfeathered portions of the head and paint the exposed surfaces with turpentine or tincture of iodine.

DISEASES OF THE INTESTINES.

This disease group equals in importance that previously considered. In fact, when chicks, as well as older birds, are taken into account, intestinal affections cause a much greater mortality. The various affections belonging to this group are so generally characterized by diarrhea as the prominent symptom that the name "diarrhea," with various prefixes (white, pasty, bacillary, protozoal, coccidial, flagellate, verminous), is apt to be the more common designation. Whatever the character of the disease, whether it presents the symptom of diarrhea or of constipation, whether it appears to be a mere disturbance of the digestive apparatus from improper feeding or a manifestly infectious malady, it must be understood that after a few days the disturbance takes on the character of a local in-

Light Brahma Pullet. Dept. of Agr.



A Hen Suffering From Acute Spirochaetosis. (After Balfour.) B. A. I. 1910.

testinal infection due to the multiplication of micro-organisms in the intestinal tract. Hence all indications for treatment must be based on the possibility of infection either present or imminent. These indications are met by maxims 1, 2, and 3—clean out, clean up, and clean the water supply. If the intestinal disturbance has been induced by moldy or otherwise improper feed, further treatment as indicated in maxim 4 is called for, namely, stop feeding the contaminated material; or if compelled to continue, apply strong heat to the moldy feed stuff.

It is doubtful if a complete cure is ever effected in cases of infectious diarrhea. Some of the infective organisms are apt to become permanently located in some portion of the intestinal tract. As a result the cloaca becomes contaminated with these microbes, and consequently there takes place a pollution of the eggshell in its passage through the cloaca. Hence the next indication is met by maxim 5, cleanse eggs in grain alcohol just before placing them in the incubator. Moreover, since there is always the possibility of a mild attack of one of these infectious diarrheas having escaped the poulterer's notice, with the result that eggs from a hen which has thus suffered have been placed uncleansed in the incubator, a further indication for treatment in the overcoming of diarrheal affections in poultry calls for the treatment required by maxim 6, clean incubators and brooders. Sooner or later, if these affections persist in the flock, the poultryman must recognize the value of maxim 7, clean breeding by using the youngest females consistent with the requirements governing the production of vigorous stock.

Before starting in on a course of treatment like the above the poulterer should consider whether the sick birds are worth the trouble. He should also consider whether he can afford to risk the exposure of his healthy birds to the dangers incident to the presence of disease upon his premises. Whichever way he decides, he must undoubtedly see that it is better to apply the seven maxims as a preventive measure than wait to adopt them as a basis of treatment. He must further remember to quarantine all new birds, and neither introduce into the flock nor allow to remain in it any bird that shows watery eyes, running at the nose, noisy breathing, or soiling of the feathers around the vent. Such birds, in all probability, suffer from roup or intestinal infection in mild form, yet are able to disseminate the causative agents of the disease throughout the flock.

DISEASES OF POULTRY.

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